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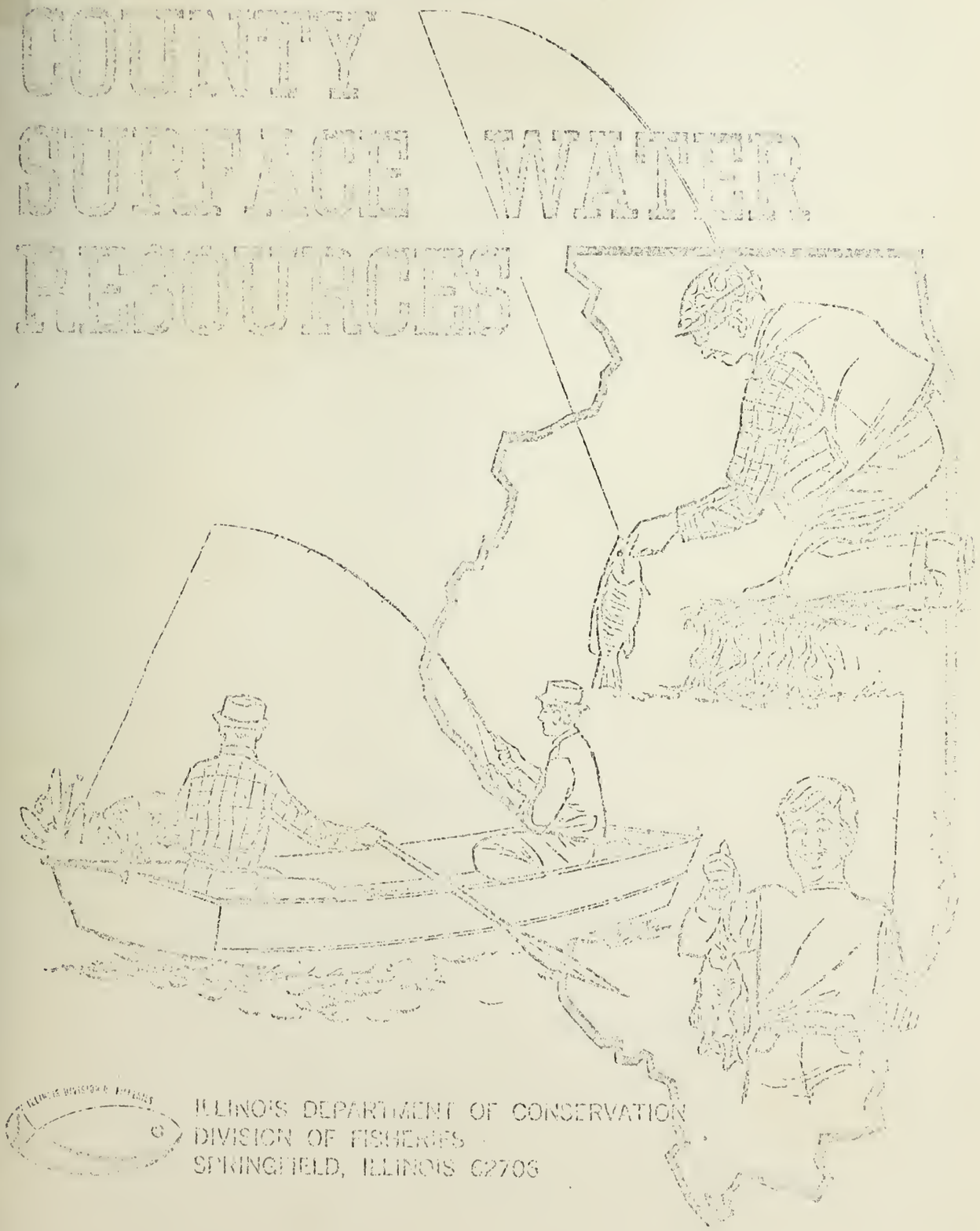
MARSHALL COUNTY SURFACE WATER RESOURCES



ILLINOIS DEPARTMENT OF CONSERVATION
DIVISION OF FISHERIES
SPRINGFIELD, ILLINOIS 62706

ACKNOWLEDGEMENTS

Data for this report was obtained from information available in the files of the Department of Conservation, and other county and state agencies associated with conservation. The final report was typed by Ann Havey, Typist.

August 1975

ILLINOIS DEPARTMENT OF CONSERVATION
DIVISION OF FISHERIES

MARSHALL COUNTY
SURFACE WATER RESOURCES

BY

MIKE CONLIN
FISHERY BIOLOGIST

MARCH 1975

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Natural History

PREFACE

THE HIGHER STANDARD OF LIVING ENJOYED TODAY BY ILLINOIS CITIZENS HAS RESULTED IN AN INCREASED AMOUNT OF LEISURE TIME TO PURSUE OUTDOOR RECREATION. THERE HAS BEEN AN INCREASED INTEREST IN BOATING, SAILING, CANOEING, WATER-SKIING, FISHING, SKIN DIVING, AND OTHER WATER ASSOCIATED SPORTS. DEMANDS BY INDUSTRY, AGRICULTURE AND URBAN EXPANSION HAVE ALSO PLACED HEAVY BURDENS ON SURFACE WATERS. IT IS TIME TO TAKE STOCK OF OUR EXISTING AND POTENTIAL RESOURCES AND PROBLEMS TO PLAN FOR THE FUTURE.

A COUNTY WATER RESOURCE REPORT, SUCH AS THIS ONE, IS AN ATTEMPT BY THE DIVISION OF FISHERIES OF THE ILLINOIS DEPARTMENT OF CONSERVATION TO SUMMARIZE DATA ON THE MORE IMPORTANT EXISTING WATER RESOURCES AND THEIR RECREATIONAL VALUE. WITH THIS DATA AVAILABLE, A METHOD TO APPORTION USAGE OF WATER IN THE BEST INTEREST OF THE PUBLIC CAN BE DETERMINED TOGETHER WITH THE POTENTIAL NEEDS.

THIS INVENTORY IS AN EXTENSIVE SURVEY OF THE SURFACE WATER RESOURCES AND RELATED ITEMS IN MARSHALL COUNTY. EMPHASIS HAS BEEN PLACED ON THE AREAS OF GREATEST USE AND RECREATIONAL VALUE. THE INFORMATION PROVIDED IN THIS REPORT HAS BEEN OBTAINED FROM PAST RECORDS ON FILE IN THE ILLINOIS DEPARTMENT OF CONSERVATION, OTHER CONSERVATION AGENCIES, AND DATA COLLECTED BY FISHERY BIOLOGISTS AND FISH CONSERVATION AGENTS.

IN 1964, WITH THE PUBLICATION OF "ILLINOIS SURFACE WATER INVENTORY", THE DIVISION OF FISHERIES PROVIDED THE STATE WITH THE FIRST STATISTICAL SUMMARY OF SURFACE WATER RESOURCES. THIS WAS A COMPILATION OF WATERS IN EACH COUNTY WITH NO EVAULATION AS TO THEIR USE. IN ORDER TO HAVE MORE COMPLETE DATA AVAILABLE FOR PLANNING, THE DIVISION OF FISHERIES INAUGURATED A PROGRAM IN 1966 WHEREBY DETAILED WATER RESOURCE REPORTS WERE TO BE PREPARED FOR EACH OF THE 102 COUNTIES IN ILLINOIS.

THESE REPORTS SHOULD ASSIST IN LONG-RANGE PLANNING AND DEVELOPMENT OF THE STATE'S WATER RESOURCES TO MEET THE NEEDS OF THE FUTURE.

A. C. LOPINOT
CHIEF FISHERY BIOLOGIST

CONTENTS

	PAGE
PREFACE	ii
CONTENTS	iii
LIST OF FIGURES	iv
LIST OF TABLES	iv
ABSTRACT	v
GENERAL SETTING OF THE WATERS IN MARSHALL COUNTY	
PHYSIOGRAPHY	1
CLIMATE	1
GEOLOGY	6
DRAINAGE	6
SOILS	6
ALPHABETICAL LISTING AND DESCRIPTION OF MAJOR LAKES AND STREAMS	
LAKES	11
STREAMS	13
SUMMARY OF INVENTORY DATA	
POPULATION	17
WATER RESOURCES	17
LAKE MORPHOMETRY AND ORIGIN	17
WATER QUALITY	22
FISHERIES	24
WETLANDS	24
PUBLIC USE AND ACCESS	27
COTTAGE AND HOMESITE DEVELOPMENT	27
PRESENT AND POTENTIAL USES OF SURFACE WATER	
FISHING (SPORT AND COMMERCIAL)	30
BOATING	30
SWIMMING	30
CAMPING	33
HUNTING AND TRAPPING	33
AESTHETICS	33
SURFACE WATER PROBLEMS	
POLLUTION	38
FLUCTUATING WATER LEVELS	38
THE FUTURE	39
BIBLIOGRAPHY	40
SOURCE OF DATA	42
GLOSSARY	43

LIST OF FIGURES

1. General Highway Map of Marshall County.
2. Location of Marshall County in Illinois.
3. Average Annual Precipitation for Marshall and Surrounding Counties.
4. Drainage Map of Marshall County.
5. Soils Map for Marshall County.
6. Marshall County and State of Illinois Populations from 1900-1970.
7. Pole and Line Fishing License Sales 1963-1972.
8. Potential Reservoirs in Marshall County.
9. Hunting License Sales 1963-1972.

LIST OF TABLES

1. Climatological Data by Month for Marshall County.
2. Population and Land Area Comparison of Marshall County to the State of Illinois.
3. Population and Percent Change Between 1960-1970 for Marshall County and Townships Containing Major Cities.
4. Summary of Marshall County Impoundments.
5. Summary of Major Streams in Marshall County.
6. A List of All Fishes Known to Occur in Marshall County.
7. Public Lands with Water Frontage in Marshall County.
8. Total Attendance Figures for Marshall County Conservation Area and State Recreational Areas.
9. State and County Boat Licenses 1962-1973.
10. State and County Trapping License Sales 1950-1972.

ABSTRACT

Marshall County, with a population of 13,302 (1970 census) is located in north-central Illinois. The county has a total surface area of 391 square miles. The Illinois River flows from the northeast to the southwest, separating the county into a western one-third and an eastern two-thirds.

Row crop agriculture is the base of the county's economy. 87.1 percent of all county lands are in farm usage. That portion of Marshall County west of the Illinois River is gently rolling and well drained. East of the river the topography is more level but drainage is adequate.

The climate is typical of central Illinois with a wide range of temperature between the extremes of summer and winter and an abundant, well distributed rainfall. Mean annual precipitation is 33.01 inches.

Water resources total 114 artificial impoundments (340.35 acres), 24 natural lakes (5,750.2 acres) and six streams of significant size (2,754.3 acres). In 1972 there were 1,754 licensed fishermen, 1,517 licensed hunters, 33 licensed trappers and 342 registered boats in the county.

Industrial and municipal pollutional problems from within the county pose no major threat at present. Silt, mainly from agricultural sources, is the major pollutant in Marshall County waters. Fish and wildlife along with associated water based recreation will surely decline in the years ahead unless the Illinois River siltation question is alleviated by proper upland soil conservation measures. Stream channelization or ditching, farming of stream-side lands, fall plowing, and unlimited livestock access to waterways are several of the major contributing causes of stream siltation in the county.

GENERAL SETTING OF THE WATERS OF MARSHALL COUNTY

Marshall County (Fig. 1) is located in the north-central part of Illinois about 25 miles northeast of Peoria. It is bordered by Peoria, Woodford, La Salle, Putnam, Bureau and Stark counties (Fig. 2). The county has an area of 391 square miles comprising 12 townships. Lacon, the county seat, is located on the east side of the Illinois River.

Marshall County was officially organized in 1839. Two of the early settlers were Colonel John Strawn and Jesse Roberts, who came to the region with their families about 1828. The population of the county grew rapidly until 1870, when a maximum of 17,000 was reached. 13,302 (1970 census) people presently reside in the county.

Agriculture is a major factor in the economy of Marshall County with 87.1 percent of all county land in farm usage. Light to heavy industry is located primarily along the Illinois River.

The climate of Marshall County is typical of central Illinois with a wide range in temperature and an abundant rainfall. The growing season is approximately 170 days.

PHYSIOGRAPHY

The parent material of the upland soils of Marshall County was deposited during the glacial period. Bottom land soils were derived from the glacial material through erosion and stream deposition. The upper till of Marshall County was deposited by advances of the Wisconsin glaciation. This glacial period was distinguished by two distinct advances. The first advance covered the entire county. The second advance moved in from the northeast and covered only the eastern portion of the county.

The average elevation of the Illinois River in the county is 443 feet above sea level. The highest elevation is on top of the moraine at Lawn Ridge (825 feet). Average elevation for the county varies between 600 and 700 feet (Winters, et al., 1937).

CLIMATE

Marshall County lies in an area which receives from 32-35 inches of precipitation annually (Fig. 3). The average annual precipitation is 33.01 inches (Table 1). Heaviest 24 hour rainfall (5.01 in.) on record occurred in August, 1943.

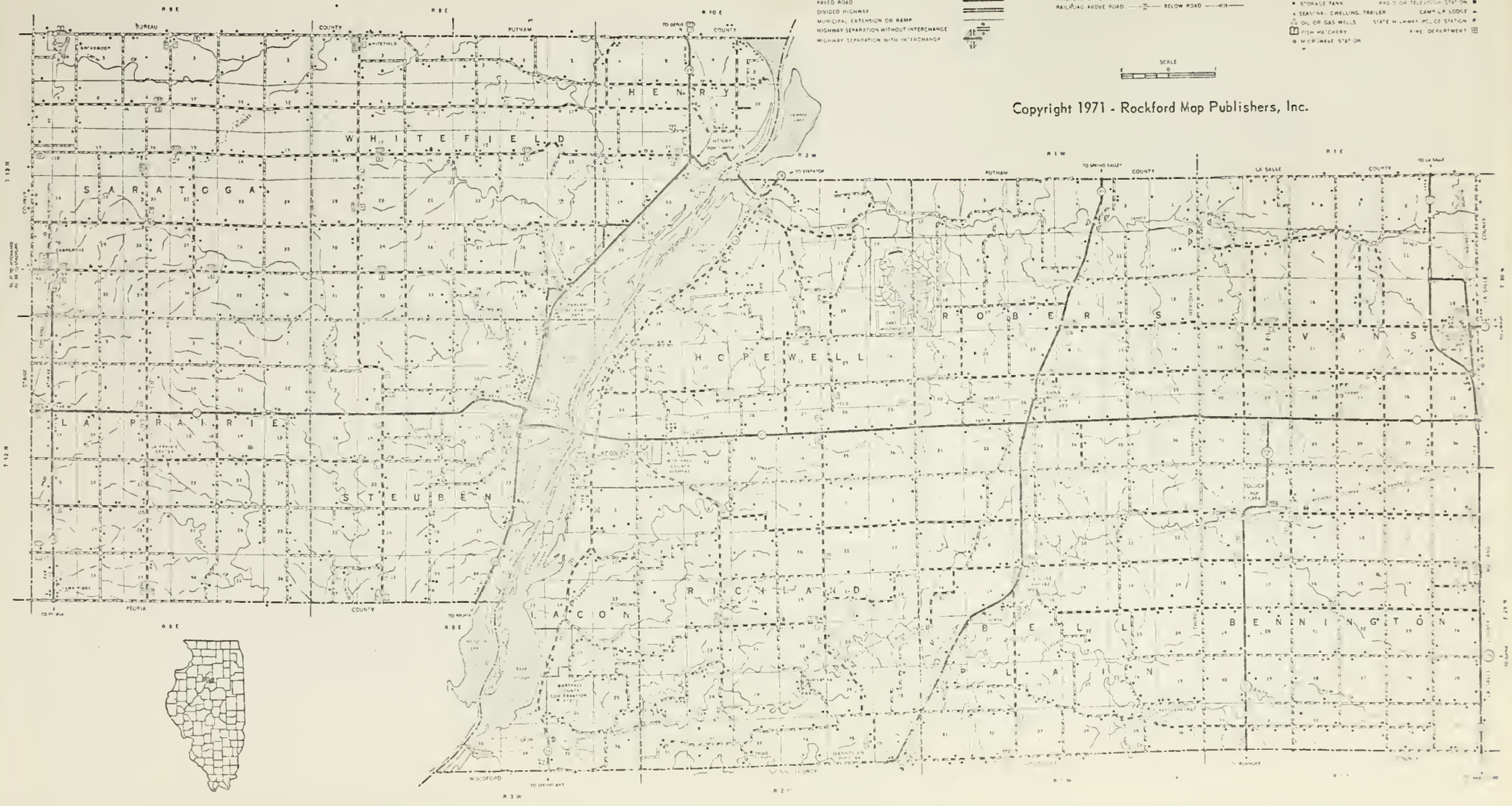
The annual range of temperatures often varies from 10 to 15 degrees below zero in winter to 100 degrees or higher in summer. The lowest recorded temperature was -24°F. in January, 1927; the maximum temperature of record was recorded in July, 1951 (111°F). Annual mean temperature is 51°F.

The heaviest snowfall generally occurs in January (6.7 in. average). The greatest depth of snow on the ground (20 inches) was recorded in 1960. Mean annual snowfall is 24.6 inches.

Average date of the last killing frost during spring is April 26; the earliest in fall, October 13. The extremes of the growing season (average 170 days) have been as short as 138 days and as long as 209 days.

MARSHALL COUNTY
ILLINOIS

FIGURE 1.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I A C O N
B E L L E P L A I N
B E N N I N G T O N
PUTNAM COUNTY
BUREAU COUNTY
LA SALLE COUNTY
PEORIA COUNTY
WOODFORD COUNTY
MARSHALL
WHITEFIELD
TOLUCA
R 8 E
R 9 E
R 1 W
R 1 E
R 2 W
R 3 W
T 13 N
T 12 N
T 11 N

BOUNDARY LINES AND SCREENS

STATE LINE
COUNTY LINE
SURVEYED TOWNSHIP LINE
CORPORATE LIMIT LINE
CIVIL TOWNSHIP OR ROAD DISTRICT LINE
NATIONAL FOREST BOUNDARY LINE
BOUNDARY OF STRIP MINE OR MINE WASTE AREA
NATIONAL FOREST PURCHASED AREA
FOREST PRESERVE, PARK AREA OR CEMETERY
AIRPORT BOUNDARY LINE OR MILITARY RESERVATION

ROADS AND ROADWAY FEATURES

MARKED ROUTE: U.S., ILL., AND INTERSTATE
HIGHWAY WITH CONTROL OF ACCESS (CASING INDICATES FRONTAGE ROAD)
TOLL PLAZA (T), OR WEIGHT STATION (W)
FEDERAL AID PRIMARY ROUTE
FEDERAL AID SECONDARY — COUNTY HIGHWAY
UNIMPROVED ROAD
GRADED AND DRAINED ROAD
SOIL SURFACED ROAD
GRAVEL OR STONE ROAD
BITUMINOUS SURFACED ROAD
PAVED ROAD
DIVIDED HIGHWAY
MUNICIPAL EXTENSION OR RAMP
HIGHWAY SEPARATION WITHOUT INTERCHANGE
HIGHWAY SEPARATION WITH INTERCHANGE

NAVIGATION, DRAINAGE AND STRUCTURES

FREE FERRY
DAM
DOCK, PIER OR LANDING
NAVIGABLE STREAM
NARROW STREAM
INTERMITTENT STREAM
DRAINAGE DITCH OR DREDGED STREAM
CANAL
TOLL FERRY
DAM WITH LOCK
LEVEE

HIGHWAY BRIDGES OVER LARGE RIVERS
TRUSS
MOVABLE
ARCH
CANTILEVER
SUSPENSION
OTHER HIGHWAY BRIDGES OVER 20 FT. SPAN
FORD OVER 20 FT. IN LENGTH

AIRPORTS

COMPLETE FACILITIES
MILITARY
LIMITED FACILITIES
SEAPLANE BASE

RAILROADS

RAILWAY OPERATED BY SINGLE COMPANY OR OTHER CARRIER ON SAME TRACKS
RAILROAD WITH TWO OR MORE TRACKS OF SEPARATE COMPANIES OR ADJACENT RIGHTS OF WAY
RAILROAD STATION (REVENUE STOP)
RAILROAD GRADE CROSSING
RAILROAD ABOVE ROAD — BELOW ROAD

SCALE

MUNICIPAL CENTER COUNTY SEAT ● OTHER ○
ADJACENT INCORPORATED AREA

CULTURAL FEATURES

FARM UNIT (FIGURE DENOTES NUMBER OF UNITS) DWELLING
BUSINESS ESTABLISHMENT INDUSTRIAL PLANT
SCHOOL HOSPITAL OR NURSING HOME
CHURCH MOTEL OR HOTEL
PUBLIC BUILDING POST OFFICE
CEMETERY CHURCH WITH CEMETERY ADJACENT
MINE SHAFT GRAVEL PIT OR QUARRY
GARBAGE, REFUSE AND OTHER DUMP POWER PLANT
AUTO OR SCRAP METAL JUNKYARD HIGHWAY GARAGE
ATHLETIC FIELD OR AMUSEMENT PARK SUBSTATION
SEWAGE DISPOSAL GOLF COURSE OR COUNTRY CLUB
SMALL PARK RIFLE CLUB
REST AREA CORRECTIONAL INSTITUTION
INCINERATOR COUNTY FARM OR PRESERVE
FAIR GROUND OR RACE COURSE DRIVE-IN THEATRE
GAUGING OR PUMPING STATION (GENERAL) SCENIC SITE
LOOKOUT TOWER COMPRESSOR STATION
GRAIN STORAGE BIN SAWMILL (STATIONARY)
STORAGE TANK RADIO OR TELEVISION STATION
SEASONAL DWELLING, TRAILER CAMP OR LODGE
OIL OR GAS WELLS STATE HIGHWAY POLICE STATION
FISH HATCHERY RIME DEPARTMENT
MICROWAVE STATION

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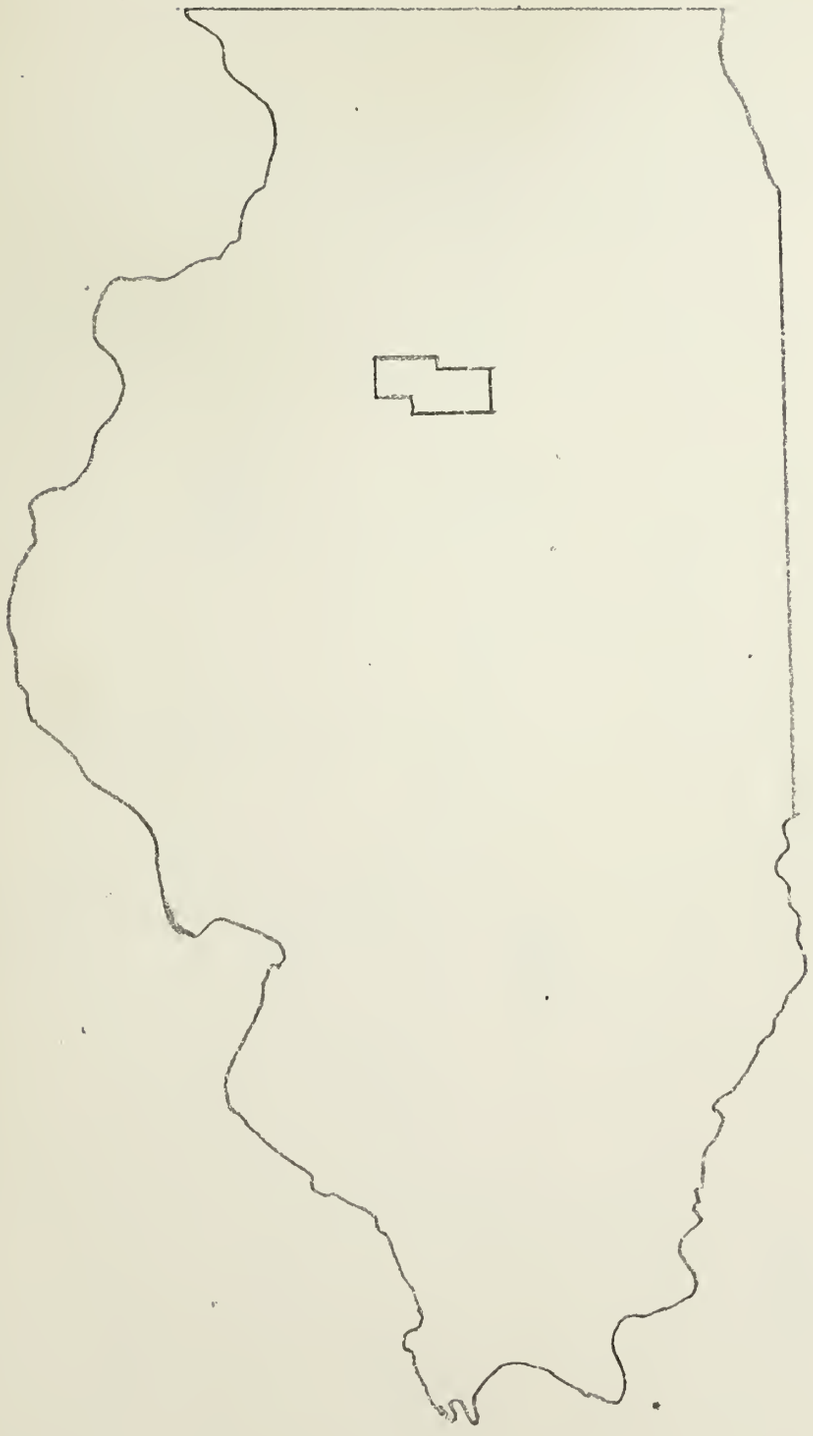


FIGURE 2. LOCATION OF MARSHALL COUNTY IN ILLINOIS

FIGURE 3 . AVERAGE ANNUAL PRECIPITATION (INCHES) FOR MARSHALL AND SURROUNDING COUNTIES (Denmark, 1969).

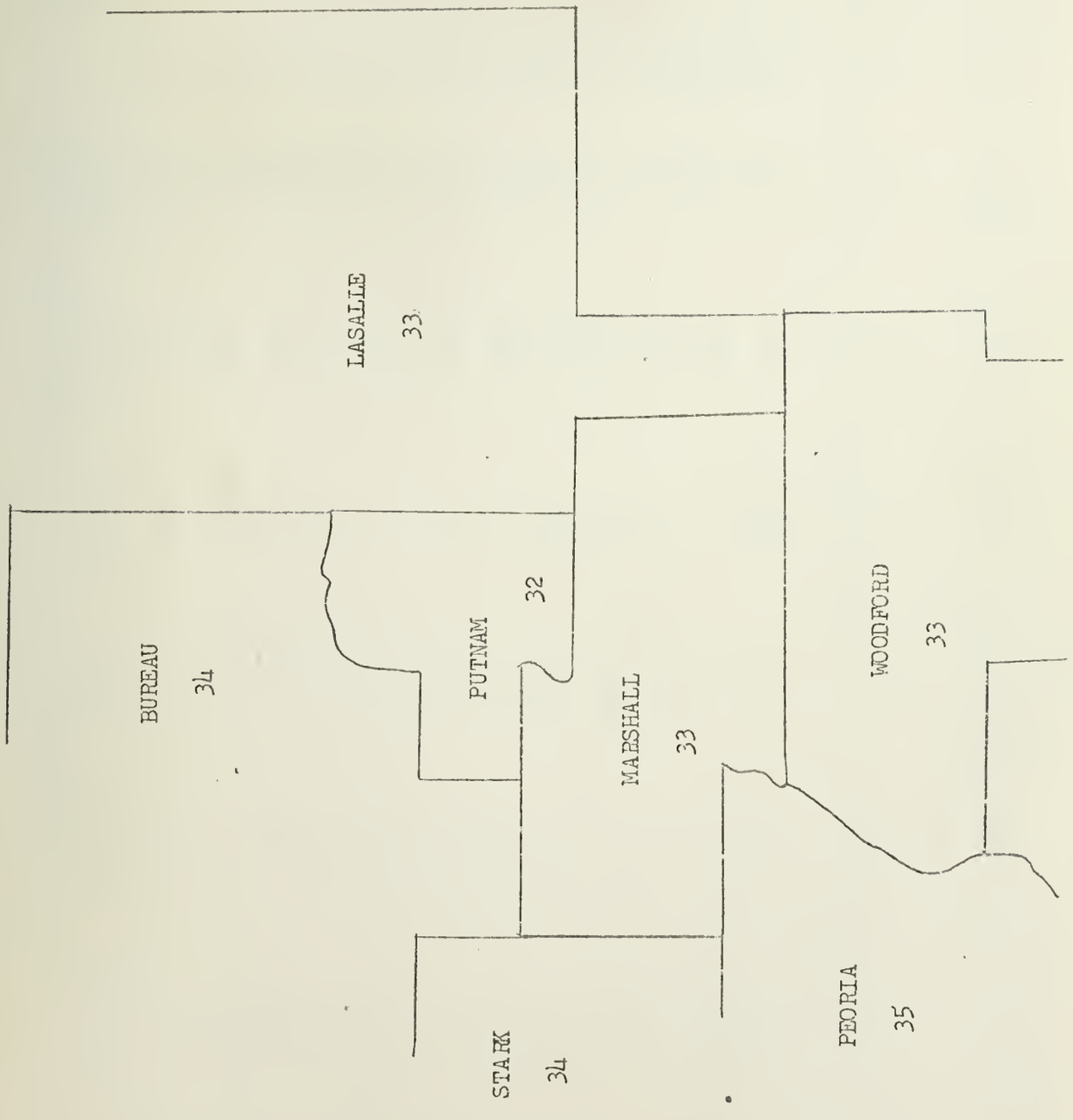


TABLE 1 . CLIMATOLOGICAL DATA BY MONTH FOR MARSHALL COUNTY[a,b]

	Temperatures					Precipitation (inches)			Snowfall (inches)		
Month	Daily Mean	Mean Daily Maximum	Mean Daily Minimum	Highest Recorded	Lowest Recorded	Mean Monthly Total	Max. in 24 Hrs.	Year	Mean Monthly	Greatest Depth	Year
Jan.	24.9	33.5	16.3	68	-21	1.72	2.04	1965	6.7	13	1967
Feb.	27.8	36.7	18.9	71	-21	1.53	3.53	1942	5.5	12	1933
March	37.7	47.6	27.9	84	-14	2.52	2.30	1933	4.1	20	1960
April	50.7	62.4	39.1	90	18	3.67	3.05	1947	0.6	2	1961+
May	61.5	73.8	49.2	103	24	3.84	3.27	1944	0	0	
June	71.5	83.9	59.2	105	36	3.49	3.06	1968	0	0	
July	74.9	87.5	62.4	111	45	3.57	4.68	1951	0	0	
Aug.	73.1	85.6	60.6	105	38	3.06	5.01	1943	0	0	
Sept.	65.9	78.9	53.0	102	24	3.20	3.87	1933	0.1	0	
Oct.	55.2	67.7	42.7	93	17	2.38	3.84	1957	0.1	1	1967
Nov.	39.9	49.5	30.3	82	-5	2.12	2.53	1931	2.0	8	1951
Dec.	28.3	36.6	20.1	65	-20	1.91	3.49	1949	5.5	13	1951
Year	51.0	62.0	40.0	111	-21	33.01	5.01	1943	24.6	20	1960

a - Data for Marshall County based on observations (1931-1968) at weather station at Minonk, Illinois.
b - Data obtained from the Illinois Cooperative Crop Reporting Service, Springfield, Illinois.
+ - Also on earlier date(s).

GEOLOGY

Illinois has been covered at different times, by the advance of four glaciers. Two glaciers, the Illinoian and Wisconsian, are known to have covered Marshall County. However, only the Wisconsian glacial till and the rich windblown material or loess as was deposited after the retreat of the Wisconsian, were important as parent soil materials. The parent material of the bottomland soils is alluvium. Alluvium is of geologically recent origin and was deposited by silt laden flooded streams. Loess is rich in plant food elements and is an excellent soil parent material. From this loess, a majority of the present soils of the county were formed.

Most of the silt, sand, and gravel in the Illinois Valley was deposited by melt water of the late Wisconsian glacier (Winters, et al., 1937).

DRAINAGE

West of the Illinois River, Marshall County is gently rolling and fairly well drained. Land east of the river is more level and except for a small ridge at Varna most of the relief is due to stream erosion. Drainage east of the river is termed as adequate.

Headwater erosion has been active in dissecting the land along the Illinois River and for a short distance along the major streams (e.g. Big Sandy and Crow creeks). Except for two small streams just below Camp Grove, all streams of the county drain to the Illinois River (Fig. 4).

SOILS

There are twenty-eight soil types in Marshall County (Winters, et al., 1937). Below are discussed the nine most common and important types (Fig. 5).

Muscatine Silt Loam: Muscatine silt loam is the most prevalent soil type in Marshall County. It is well distributed over the county and occupies nearly 100 square miles. This type is a dark-colored soil developed on undulating to gently rolling topography in areas where the loess is 50 inches or more thick. It is higher in organic matter than is Tama silt loam, and varies in acidity from slight to medium.

The surface is a faintly granular brown silt loam 7 to 10 inches thick. The subsurface is yellowish-brown and extends to 14 or 18 inches. The subsoil is a yellowish-brown silty clay loam that breaks into small subangular fragments. Carbonates usually occur at 40 to 60 inches. The profile is friable throughout and absorbs water readily.

Tama Silt Loam: Tama silt loam is a dark-colored soil developed on moderately sloping topography in areas where the loess is 50 inches or more thick. It is the second most extensive soil in Marshall County. It is distributed fairly well throughout the county and covers altogether nearly 50 square miles. The soil is medium acid and medium in organic matter.

The surface, 5 to 7 inches thick is a brown to light-brown silt loam. The subsurface is brownish-yellow. The subsoil begins at 9 to 16 inches and is a reddish-yellow silty clay loam. The profile of this soil is friable throughout and absorbs water readily. Calcareous material usually occurs about 50 inches beneath the surface.

Clinton Silt Loam: Clinton silt loam is a light-colored soil that has developed on moderately sloping topography in areas where the loess is 50 inches or more thick.

FIGURE 4. DRAINAGE MAP OF MARSHALL COUNTY

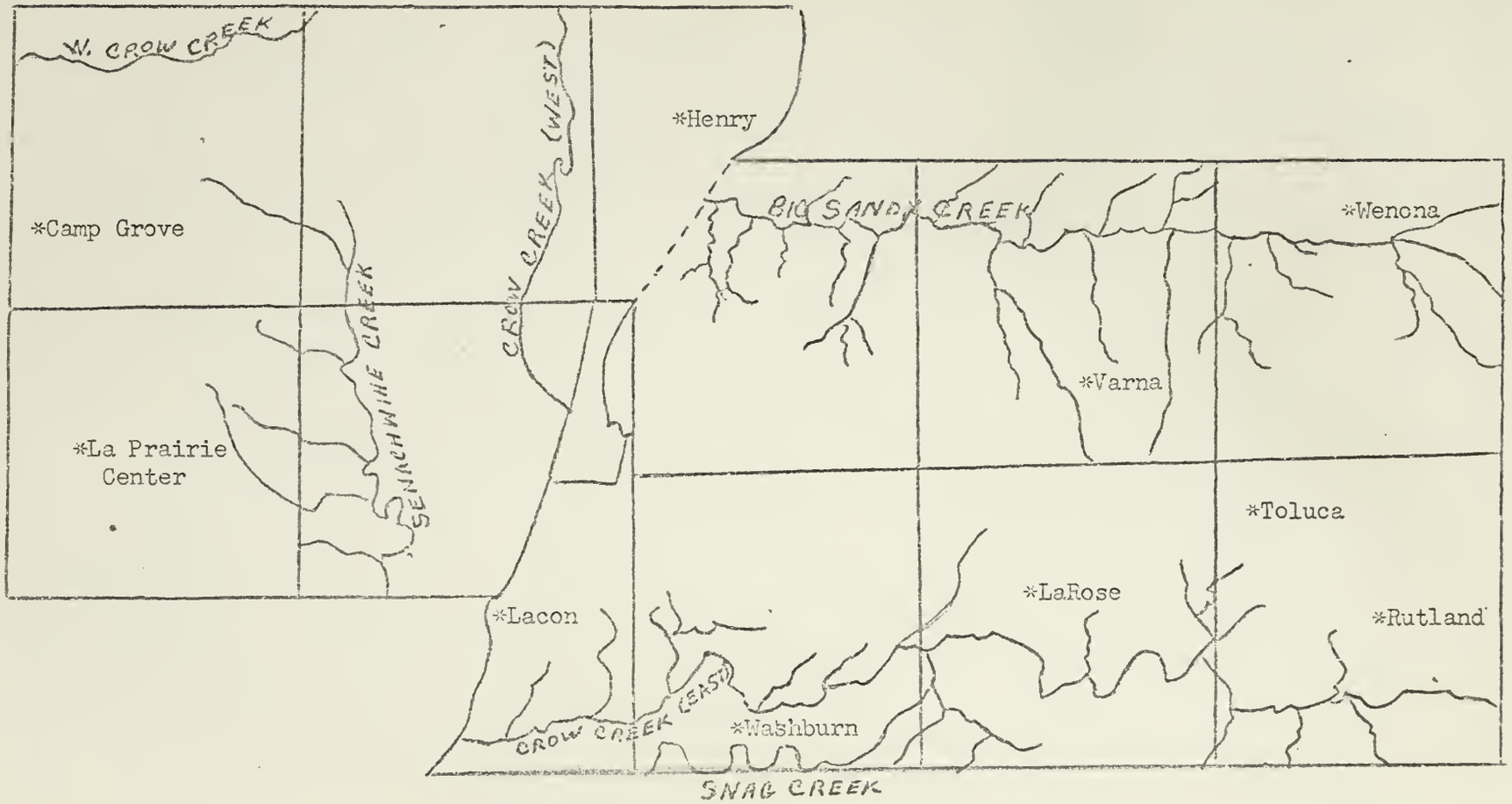
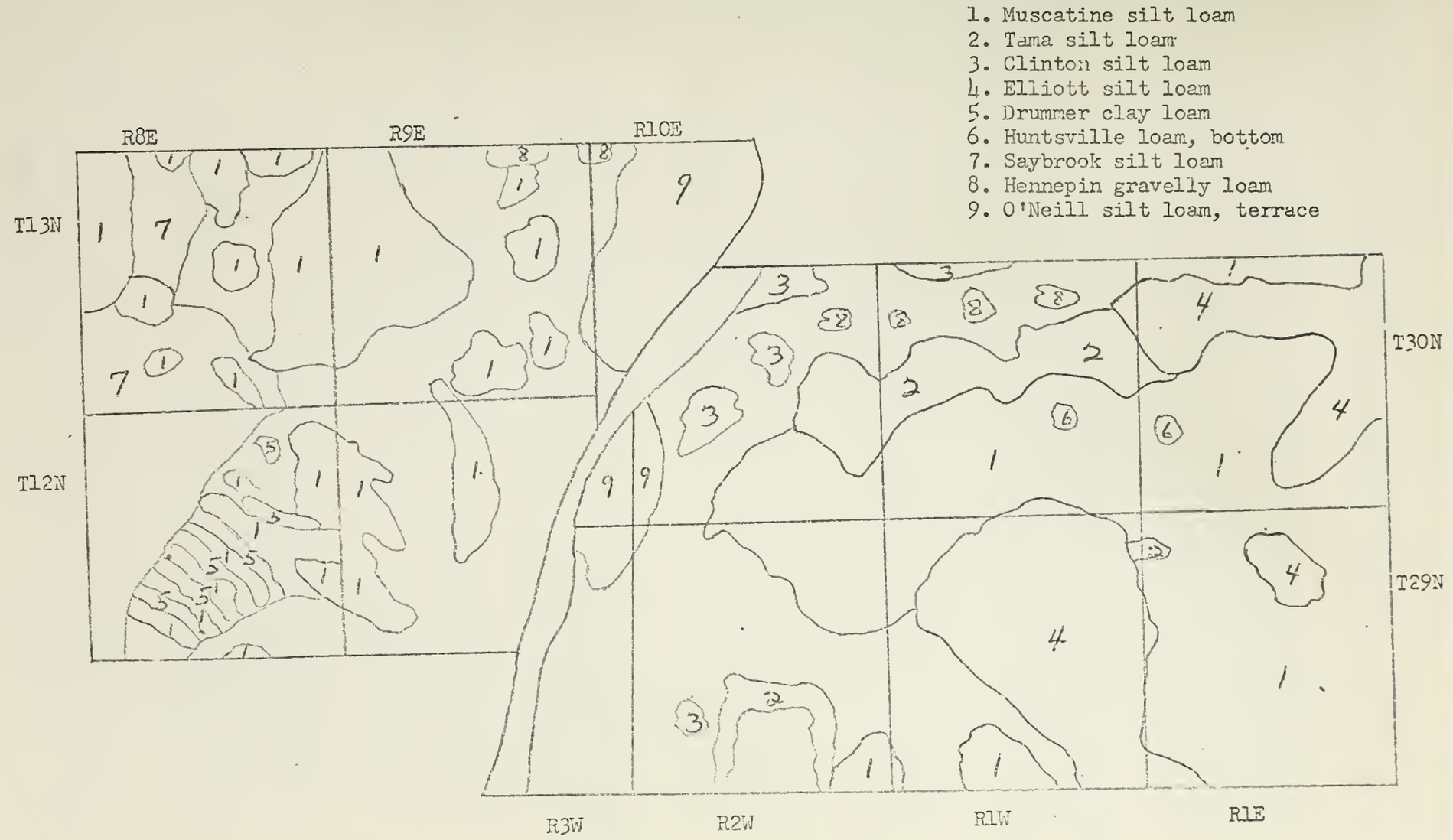


FIGURE 5 . SOILS MAP FOR MARSHALL COUNTY



Source: Winters, E. et. al. 1937. Marshall County Soils

It occurs chiefly along the larger streams and represents the most extensive forest soil in Marshall County, covering all told more than 35 square miles. It is acid and low in organic matter.

The surface soil is a grayish-yellow indistinctly granular silt loam. The subsurface, beginning at 7 to 8 inches, is more distinctly yellow than the surface and shows little indication of a definite structure. In texture it is silt loam and, where there is but little slope, the yellow color is not pronounced. The subsoil, beginning at 18 to 20 inches, is a drabbish-yellow medium-compact and medium-plastic silty clay loam. Below about 35 inches the material is friable, and between 50 to 60 inches it is calcareous.

Elliott Silt Loam: Elliott silt loam is a dark-colored soil developed on undulating to rolling topography. Most of it is found in the east half of the county. In extent it embraces more than 30 square miles. The acidity is slight to medium and the organic matter content is medium. The parent material from which this soil was developed is plastic calcareous till covered by a loess blanket of varying thickness but never exceeding about 40 inches.

The surface, 5 to 8 inches thick, is a brown silt loam showing faint granular structures. The subsurface is a yellowish-brown silt loam extending to a depth of 12 to 18 inches. The subsoil is a rather plastic drabbish-yellow clay loam. Plastic calcareous till occurs at 25 to 40 inches beneath the surface. In places where the till comes closer to the surface, the subsoil is heavier and more plastic.

Drummer Clay Loam: Drummer clay loam is a dark-colored soil occurring in depressions, along drainage channels, and on extended flats in regions where the loess is less than 40 inches thick. Thus it is found at some distance away from the Illinois River. This type occupies about 25 square miles. In many places small areas of Harpster clay loam are present in the Drummer clay loam.

The surface soil is a well-granulated black clay loam about 10 inches thich and usually contains some pebbles. It is high in organic matter and in plant nutrients. The subsurface is a black clay loam with a drabbish cast, resting at about 18 to 35 inches in depth on a mixed gray and pale-yellow clay or clay loam. Beneath about 35 inches the material is more friable and more brightly colored with yellow.

Huntsville Loam (Bottom): Huntsville loam, bottom, is a dark-colored soil that occurs on the first bottoms along the rivers and streams. All of its 24 square miles is subject to occasional or even frequent overflow, while much of that along the Illinois River is swampy. It shows but little profile development and varies in character according to the recent sediments of which it is composed. In general it is silty in texture and medium to dark brown in color.

Saybrook Silt Loam: Saybrook silt loam is a dark-colored soil developed on gently rolling to rolling topography. It occurs only in the extreme western part of Marshall County, where it occupies over 23 square miles. The parent material from which this soil was developed is loess and friable calcareous till. The loess blanket covering the till varies in thickness but never exceeds about 40 inches. The organic matter content varies with the slope, being lower on the more strongly sloping areas. The acidity varies from slight to medium.

The surface, which is 3 to 7 inches thick depending on the amount of erosion, is a brown to light-brown silt loam. The subsurface is yellowish brown. The subsoil, which begins at 10 to 18 inches and which frequently contains a scattering of pebbles, is a brownish-yellow silty clay loam that tends toward a reddish yellow on the more pronounced slopes. Carbonates occur at 25 to 45 inches.

Hennepin Gravelly Loam: Hennepin gravelly loam occurs on very rolling to steep topography along streams. It covers about 22 square miles in Marshall County.

In a virgin forest area, where but little soil material has been lost by erosion, the surface soil is of a brownish-yellow color and is 3 to 5 inches thick. The subsurface is yellow, and the subsoil is a reddish-yellow gravelly material, beginning at 6 to 10 inches. Calcareous till is usually near the surface and in many places has already been exposed by erosion.

O'Neill Silt Loam (Terrace): O'Neill silt loam, terrace, is a dark-colored soil developed on the undulating to gently rolling second bottomland. Two large tracts occur, one at Henry and the other at Lacon, making up a total of 16.5 square miles. Overflow seldom occurs, and when it does the water quickly recedes. The presence of a gravelly stratum at 25 to 35 inches causes rapid underdrainage, resulting in a droughty condition.

The surface is a brown to light-brown silt loam, often containing appreciable quantities of sand. The subsurface, beginning at 5 to 8 inches, is a reddish-brown sandy silt loam. The subsoil starts at 12 to 16 inches and is a reddish-yellow silty clay loam containing sand and gravel. Coarse stratified sand and gravel is encountered at 25 to 35 inches.

ALPHABETICAL LISTING AND DESCRIPTION OF MAJOR LAKES AND STREAMS

LAKES

IN ILLINOIS, WE DISTINGUISH LAKES FROM PONDS BY ARBITRARILY SETTING THE MINIMUM SIZE FOR LAKE CLASSIFICATION AT 6.0 ACRES; THOSE SMALLER THAN 6.0 ACRES ARE CLASSIFIED AS PONDS. WE FURTHER CLASSIFY THESE IMPOUNDMENTS BY OWNERSHIP AS FOLLOWS:

1. STATE: ALL IMPOUNDMENTS OWNED AND MAINTAINED BY THE ILLINOIS DEPARTMENT OF CONSERVATION.

2. PUBLIC: ALL IMPOUNDMENTS OWNED AND MAINTAINED BY A GOVERNMENTAL AGENCY.

3. ORGANIZATIONAL: ALL IMPOUNDMENTS OWNED, LEASED OR MAINTAINED BY ANY ORGANIZATION OF SIX OR MORE MEMBERS. THIS INCLUDES THE FOLLOWING TYPES OF ORGANIZATIONS: SPORTSMEN CLUBS, SCOUTS, CHURCH, CIVIC, FRATERNAL, ASSOCIATIONS, SUBDIVISIONS, COUNTRY CLUBS, INDUSTRIAL, AND INSTITUTIONS.

4. PRIVATE: ALL IMPOUNDMENTS PRIVATELY OWNED OR LEASED WITH NO FEE ASSESSED FOR THEIR USE.

5. FEE: ALL IMPOUNDMENTS PRIVATELY OWNED OR LEASED WHICH CHARGE A FEE FOR FISHING.

THE FORMAT USED IN THIS SECTION PROVIDES: (1) THE NAME OF THE LAKE; (2) THE TOWNSHIP, RANGE, AND SECTION NUMBER OF THE WATER AREA; (3) TYPE OF OWNERSHIP; (4) SURFACE ACRES TO THE NEAREST 0.1 ACRE; (5) MAXIMUM DEPTH IN FEET; (6) SHORELINE LENGTH (WHEN AVAILABLE); AND (7) THE YEAR THE LAKE WAS CONSTRUCTED OR OTHERWISE LISTED AS NATURAL.

BROADMOOR LAKE: T13N, R8E, SECTION 6; ORGANIZATIONAL; SURFACE ACRES = 18.2; MAXIMUM DEPTH = 6.0 FEET; CONSTRUCTED = 1905.

A 1969 FISHERY ANALYSIS SHOWED FISH SPECIES PRESENT TO BE LARGEMOUTH BASS, BLUEGILL, BLACK BULLHEAD, CHANNEL CATFISH, AND NORTHERN PIKE. AT THAT TIME THE BLUEGILL POPULATION NEEDED REDUCING IN ORDER TO RESTORE SUITABLE QUALITY ANGLER SUCCESS. DURING JUNE, '1970 A SEVERE FISH KILL OCCURRED WHICH WAS SELECTIVE IN KILLING BLUEGILL. CAUSE OF THIS DIE-OFF WAS BELIEVED TO BE A CORN ROOTWORM INSECTICIDE WASHING IN FROM THE WATERSHED. DUE TO THE OVERPOPULATED BLUEGILL POPULATION, IT WAS HOPED THAT THE KILL MIGHT HAVE DONE MORE GOOD THAN HARM.

THERE ARE APPROXIMATELY 250 MEMBERS IN THE CLUB. FISHING AND PICNICKING ARE THE MORE IMPORTANT ACTIVITIES.

LAKE TANGLEWOOD: T30N, R1W, SECTION 7; ORGANIZATIONAL; SURFACE ACRES = 14.0; MAXIMUM DEPTH = 14.0 FEET; SHORELINE LENGTH - 1.4 MILES; CONSTRUCTED = 1968.

LOCATED 3.5 MILES NORTHWEST OF VARNA, THIS LAKE IS OWNED BY LOT OWNERS (LAKE WILDWOOD ASSOCIATION) WHO ARE BUILDING HOMES AROUND THE LAKE. DURING 1972 THE LAKE WAS DRAINED AND DREDGED DUE TO A HEAVY SILTATION PROBLEM. THE LAKE WAS TO BE RESTOCKED WITH LARGEMOUTH BASS, BLUEGILL, REDEAR SUNFISH AND CHANNEL CATFISH.

LAKE WILDWOOD: T30N, R1W, SECTIONS 18 & 19; ORGANIZATIONAL; SURFACE ACRES = 220.0; MAXIMUM DEPTH = 72.0 FEET; SHORELINE LENGTH = 7.7 MILES; CONSTRUCTED = 1968.

Lake Wildwood is located off Route 89, 3.5 miles northwest of Varna and is situated on a 1,376 acre recreation-residential area.

The lake has had a leakage problem in past years. During 1972 the lake level was 10 feet below normal. Major fish species in the lake include largemouth bass, bluegill, green sunfish, channel catfish, northern pike, and carp. A fishery management program is being conducted by John Fitzpatrick, Dwight, Illinois. Management activities considered include eradication of small undesirable fish, aquatic weed control, periodic fish stocking, and erosion control.

Marshall County Conservation Area: T29N, R3W, Section 22; State; Surface Acres = 2,557.0; Maximum Depth = 5.0 feet; Shoreline Length = 12.0 miles; Constructed = Natural.

This state owned area is located 4 miles south of Lacon along the Spring Bay road (county road No. 26). Forty campsites with electrical outlets are located on the tree-lined banks of Babbs Slough, a large Illinois River backwater.

There is a boat launching area (gravel) available or boats may be rented from the site manager. Bullheads, carp, crappie, bluegill, largemouth bass, and channel catfish are taken from the area's ditch and slough. The fishing ditch (2,500 feet in length) is fed by artesian wells. Many fishermen work the west bank of the Illinois River at the old Sparland brickyard, now a part of the Marshall County area.

Marshall County Conservation Area and Meadow Lake (a backwater located across the Illinois River in Peoria County) comprise more than 3,000 acres on which are 21 duck blind sites. Duck blind sites are awarded annually at a public drawing. During the season a check station is operated and daily drawings are held to award unclaimed blinds. Several small refuge areas are maintained during the season, usually holding 50,000 ducks, mostly mallards. Hunting is fair to good (Arthur and Kennedy, 1974).

Although the fishery of the Illinois River and its backwaters continues to demonstrate considerable rejuvination when compared to past years, the Marshall County Conservation backwater appears headed toward an inevitable siltation death. The siltation problem is massive in the Illinois River Valley and can only be fought successfully on the uplands.

Sparland Conservation Area: T12N, R9E, Section 2; State; Surface Acres = 1,100.0; Maximum Depth = 5.0 feet; Shoreline Length = 3.0 miles; Constructed = Natural.

This backwater lake is on the west side of the Illinois River, bordering the Village of Sparland. The initial acquisition for this area was made in 1925. A small parking area was constructed in 1974. No other facilities are available on this site.

Fishing is fair to good depending on water level fluctuations. When the Illinois River is at or below normal pool, the shallowness of this backwater makes boat usage extremely difficult. Principal species caught by anglers are bullheads, channel catfish, largemouth bass, crappie, bluegill and carp.

Twenty duck hunting blinds are scattered throughout the area. The sites are allocated by public drawing annually, and builders must occupy their blinds a half hour before shooting time each day, in order to reserve their blinds. Blinds not occupied by the time specified are open to anyone on a first come, first served basis. Hunting success is fair, with mallard being the most common species.

Streams

This section contains a description of six of the major permanent streams in Marshall County. The descriptive format is basically the same as that used for lakes and includes: (1) the location of the mouth of the stream or the point where the stream leaves the county; (2) surface acres of water; (3) length of stream within the county; (4) average width in feet; and (5) tributary relationship.

Big Sandy Creek: T30N, R2W, Section 4; Surface Acres = 91.3; Length = 16.5 miles; Average Width = 45 feet; Tributary to = Illinois River.

Big Sandy Creek is a medium size stream originating in western La Salle County, then flowing through Marshall County and hence into the Illinois River just north of Henry. The total stream length is approximately 27 miles, with a watershed drainage of about 135 square miles.

The unusual characteristics of this stream are its setting in scenic rolling hills and its wild, relatively undeveloped appearance. The stream bottom is characterized in much of the area by boulders, sand, and gravel and in many ways resembles a Rocky Mountain type stream. A relatively swift current with well developed pools and riffles, which offer suitable habitat for its principal game fish species, the smallmouth bass, further adds to its attractiveness. Luxuriant growths of water-willow occur in some of the more remote stream segments.

The upper end of the watershed is rather intensively farmed and some stream dredging has occurred over the past twenty years. Some channelization is also in evidence on lower stretches of this stream.

Fishing pressure on Big Sandy Creek is rather heavy with smallmouth bass being the major sport fish attraction. In a 1967 fishery survey, 47 smallmouth bass were collected from a 300 foot stream sector. During a 1974 pollution fish kill, 57 smallmouth bass were counted in a 150 foot sampling section. Channel catfish are also taken regularly by anglers. During the same pollution fish kill previously mentioned, 33 channel catfish were collected from the same 150 foot sector.

Water quality in Big Sandy is normally good, although several sporatic pollutional problems do exist. One potential problem is the Lake Wildwood - Tanglewood Association Lake developments located on Shawn Creek, about one mile south of Big Sandy Creek in Hopewell Township. In the upper reaches of the watershed, the village of Wenona discharges municipal wastes (lagoon treatment system). On one occasion in August, 1973 untreated sewage was discharged due to a malfunctioning lift pump. At the extreme upper end of the Big Sandy Creek drainage area, 8,000 gallons of gasoline leaked from a Farm Service storage tank in Lostant during December, 1972. Fish killed in the receiving Big Sandy tributary ditch were valued at less than $100.

In October, 1973 an estimated 7,000 fish valued at $2,030.00 were killed in a 3 mile stream sector. Discharge from a hog waste lagoon was suspected but not proven. During August, 1974 a large fish die-off (25,000 fish valued at $4,354) occurred upstream from the stream sector affected during 1973. The causative agent in this case was proven to be silage waste dumped into a small tributary of Big Sandy Creek just east of the Route 89 bridge.

Crow Creek (East): T29N, R1E, Section 23; Surface Acres = 155.6; Length = 40.0 miles; Average Width = 33.3 feet; Tributary to = Illinois River.

The larger size of this stream, with 143 square miles of drainage area gives

IT RECREATIONAL IMPORTANCE. IT IS A PRODUCTIVE STREAM FOR FISH AND RELATIVELY LITTLE DREDGING HAS BEEN DONE EXCEPT FOR NEAR ITS JUNCTURE WITH THE ILLINOIS RIVER, WHERE IT TRAVERSES A GRAVEL MINING OPERATION NEAR LAROSE, AND IN THE UPPER REACHES OF THE INTENSIVELY FARMED WATERSHED.

A DOMESTIC SEWAGE TREATMENT PLANT AT TOLUCA ADVERSELY AFFECTS SEVERAL MILES OF THE UPSTREAM NORTH BRANCH SECTOR. HOWEVER, A NEW TREATMENT FACILITY IS NOW UNDER CONSTRUCTION AND SHOULD RECTIFY THIS PROBLEM. OTHER POLLUTIONAL PROBLEMS OF RECORD ARE A GRAVEL WASHING OPERATION NEAR LAROSE AND AN OIL PIPELINE LEAK JUST WEST OF TOLUCA. THE LATTER AFFECTED OVER 12,000 FISH HAVING A VALUE OF $733 DURING SEPTEMBER, 1974.

FISHES COLLECTED IN A 1968 SURVEY WERE (BY NUMBER) 13 PERCENT GAME, 14 PERCENT COMMERCIAL, AND 73 PERCENT FORAGE SPECIES. SMALLMOUTH BASS WERE FOUND TO BE ABUNDANT ALONG WITH DARTERS, QUILLBACK, AND BLUNTNOSE MINNOWS. FISHING PRESSURE IS OF A LOCAL NATURE AND AT SOME POINTS OF EASY ACCESS IS FAIRLY INTENSIVE.

CROW CREEK (WEST): T13N, R9E, SECTION 36; SURFACE ACRES = 48.4; LENGTH = 20.0 MILES; AVERAGE WIDTH = 20.0 FEET; TRIBUTARY TO = ILLINOIS RIVER.

THERE IS ALSO A CROW CREEK OF LARGER SIZE THAT ENTERS THE ILLINOIS RIVER FROM THE EAST SIDE WHICH HAS BEEN PREVIOUSLY DISCUSSED. CROW CREEK (WEST) IS A SMALL STREAM WHICH HAS BEEN EXTENSIVELY DREDGED FROM TWO MILES WEST OF HENRY DOWN TO ITS JUNCTURE WITH THE ILLINOIS RIVER. THIS DEGRADED SECTOR IS PRESENTLY MINIMAL AS CONCERNS RECREATIONAL SIGNIFICANCE. THE BOTTOMLAND AREA IS HEAVILY CULTIVATED FOR ROW CROPS AS CLOSE TO THE STREAM AS POSSIBLE.

SOME FISHING IS REPORTED FROM UPSTREAM AREAS. DURING A 1967 FISHERY SURVEY, YOUNG-OF-THE-YEAR SMALLMOUTH BASS WERE COLLECTED ALONG WITH CONSIDERABLE NUMBERS OF CREEK CHUBS AND BLUNTNOSE MINNOWS. NO COMMERCIAL SPECIES WERE OBSERVED. A FEW GREEN SUNFISH AND YELLOW BULLHEADS WERE ALSO NOTED DURING THE SAMPLING. WATER LEVEL FLUCTUATION OF THIS STREAM IS SAID TO BE SEVERE.

ILLINOIS RIVER: T29N, R3W, SECTION 33; SURFACE ACRES = 2,413.8; LENGTH = 18.0 MILES; AVERAGE WIDTH = 1,106.3 FEET; TRIBUTARY TO = MISSISSIPPI RIVER.

THE ILLINOIS RIVER IS FORMED IN NORTHEASTERN ILLINOIS AT THE CONFLUENCE OF THE DES PLAINES AND KANKAKEE RIVERS. THE RIVER IS 272.9 MILES IN LENGTH AND EMPTIES INTO THE MISSISSIPPI RIVER AT GRAFTON. ABOUT 44 PERCENT OF THE STATE OF ILLINOIS IS DRAINED BY THE ILLINOIS RIVER SYSTEM. THE ILLINOIS WATERWAY IS 327 MILES IN LENGTH AND HAS A 9 FOOT DEEP NAVIGATION CHANNEL FROM LAKE MICHIGAN AT CHICAGO TO ITS JUNCTURE WITH THE MISSISSIPPI RIVER. THIS WATERWAY IS ONE OF THE NATION'S BUSIEST ROUTES FOR COMMERCIAL BARGE TRANSPORTATION, HANDLING OVER 27 MILLION TONS OF COMMERCIAL PRODUCTS IN 1970.

MAN HAS GREATLY ALTERED THE BIOLOGICAL COMMUNITY STRUCTURE IN THE ILLINOIS RIVER. FLOODPLAIN DRAINAGE AND LEVEE ACTIVITIES HAVE REMOVED HALF THE AREA THE RIVER ONCE USED AND THEREFORE ELIMINATED FISH AND WILDLIFE HABITAT. NAVIGATION DAMS HAVE CREATED NEW WATER AREAS BUT HAVE DESTROYED IMPORTANT WATERFOWL MARSHES. THE DIVERSION OF CHICAGO DOMESTIC SEWAGE AND INDUSTRIAL WASTES TO THE RIVER IN 1900 HAS HAD A LASTING DETRIMENTAL EFFECT.

ALSO CONTRIBUTING HEAVILY TO THE POLLUTIONAL LOAD IS THE PEORIA-PEKIN METROPOLITAN AREA (DOMESTIC AND INDUSTRIAL WASTE) AND AGRICULTURAL RUNOFF (SILT, PESTICIDES AND FERTILIZERS). POWER PLANTS LOCATED AT VARIOUS POINTS ALONG THE RIVER ARE ALSO SOURCES OF POTENTIALLY HARMFUL THERMAL - RADIOACTIVE DISCHARGES. IN ADDITION, BARGE TOWS CONTINUALLY CHURN THE WATERS OF THE MAIN CHANNEL AND

occasionally accidental spills of oil, ammonia, etc. occur. Maintenance dredging of the 9 foot channel is often detrimental to the natural river system. Due to changes in the Illinois River occurring after 1895, twenty species of fish have been extirpated (Starrett, 1972).

Aquatic vegetation all but disappeared from Illinois River backwater lakes and sloughs during the mid-1950's. It appears that siltation is the primary factor for this floral degradation. Siltation produces turbidity which reduces sunlight penetration and reduces photosynthesis, and it creates unstable bottom conditions which make it difficult for aquatic plants to anchor themselves (Mills, et al., 1966).

Starrett (1972) considers the introduction of carp into the Illinois River in 1885 as one of the most direct impacts man has had on the ecosystem of the river. By 1908 the commercial catch of carp exceeded 15.5 million pounds (64.4 percent of the total catch). As the carp increased in abundance, the yield of native fishes declined 22.2 percent.

The history of commercial fishing on the Illinois River began before the turn of the century and reached its peak in 1908 when the catch was approximately 24 million pounds. In 1950 there were 106 full-time and 169 part-time commercial fishermen on the Illinois River. The reported catch in the Peoria Pool was 2,790,765 pounds. Carp accounted for 2.25 million pounds of the catch. By 1973 only 13 full-time and 56 part-time commercial fishermen engaged in fishing along the Illinois River. Only 26,204 pounds were taken commercially from the Peoria Pool in 1973. This represents a 99 percent reduction.

Fish populations of the Illinois River have made a resurgence during the past three years. But even with this increased population, the river is now but a fraction of its former size in terms of fishery production. Mills, et al., 1966, relate that largemouth bass were once so abundant in the river-bottom lakes that one could make wages by catching them with a cane pole for the local market. In 1897, 13,061 pounds of bass were handled commercially at the Havana fish market. Between 1899 and 1908 the commercial yield of largemouth bass increased 322 percent.

During 1974 Illinois Department of Conservation fishery biologists made collections of 41 locations on the Illinois River. Eight of the 48 species collected were more abundant. Seven of these - carp, bigmouth buffalo, green sunfish, bluegill, largemouth bass, black crappie and freshwater drum - comprised 72.6 percent of the total sample. Of catchable-sized fish sampled, largemouth bass represented only 18.9 percent as compared to 36.9 percent in 1973 samples. Continuing studies will determine whether this fishery resurgence is due to increased river flows during the past three years, more suitable water quality, or both.

Numbers of waterfowl, cormorants, herons and egrets have declined precipitously in the Illinois River Valley due to drainage, pollution and navigation dams. The loss of aquatic plants and fingernail clams is responsible for the reduced numbers of ducks using the Illinois River during their migrations. Peoria Lake, once the scene of the greatest fall concentration of diving ducks in Illinois, has suffered an almost complete loss of these birds (Mills, et al., 1966).

Federal studies are currently underway which propose increasing the depth of the navigational channel from 9 to 12 feet and replacing current locks with larger duplicate locks. Implementation of such a project could well sound the death toll for this once great river. We must then decide whether the Illinois is to remain a river or be permanently relegated to canal status. The lessons of man's past effects on the river must not be forgotten when making this evaluation.

Senachwine Creek: T12N, R9E, Section 31; Surface Acres = 36.7; Length = 11.5 miles; Average Width = 26.3 feet; Tributary to = Illinois River.

This medium size stream drains approximately 120 square miles. The lower reaches (Peoria County) of this stream have been channelized resulting in a somewhat sterilized environment. A 1967 fishery survey in this ditched sector revealed very few game fish to be present. There were a variety of minnow species, however. Stoneroller, bigmouth shiner, sand shiner, and quillback were abundant. A few small green sunfish and young-of-the-year smallmouth bass were also collected.

In Marshall County, much of Senachwine Creek is scenic with well developed pool - riffle systems. During a July, 1973 major fish die-off (cause unknown) smallmouth bass up to 2.6 pounds were observed. Other species noted during this mortality were stonecat, bullheads, carp, carpsucker spp., creek chubsucker, and a variety of minnows.

The amount of fishing pressure on this stream is unknown. Angling success should be good to excellent for smallmouth bass.

Snag Creek: T29N, R2W, Section 31; Surface Acres = 8.5; Length = 4.0 miles; Average Width = 17.5 feet; Tributary to = Illinois River.

Snag Creek, which meanders back and forth across the Marshall-Woodford County line for a considerable distance, drains approximately 45 square miles. This small stream is said to dry up in the lower reaches during the summer. Because of its size, almost no fishing pressure exists. A 1967 fishery survey 4.5 miles west of Washburn demonstrated relatively few species of fish present with creek chubs predominating. The only game fish observed at that time were a few young-of-the-year black bullheads. Crayfish were moderately abundant and algae was noted to be thickly attached to rocks.

Domestic treatment plant waste from the Village of Washburn drains into this stream. Agricultural pollutants (e.g. silt) are in evidence. However, no fish kills have been reported on this waterway. Dredging has occurred on the lower and upper sectors of the stream.

SUMMARY OF INVENTORY DATA

THE FOLLOWING MATERIAL IS A SUMMARY OF THE SURFACE WATER RESOURCES OF MARSHALL COUNTY. THE SUMMARY INCLUDES A BRIEF DESCRIPTION OF POPULATION AND AREA, WATER RESOURCE, LAKE MORPHOMETRY AND ORIGIN, WATER QUALITY, FISHERIES, WETLANDS, PUBLIC USE AND ACCESS, AND COTTAGE AND HOMESITE DEVELOPMENT.

POPULATION AND AREA

MARSHALL COUNTY WAS ESTABLISHED IN 1839. A PEAK POPULATION OF 17,000 WAS ATTAINED IN 1870. DURING THE PAST 45 YEARS THE POPULATION HAS REMAINED STABLE AT ABOUT 13,000 (FIG. 6). FROM 1960 TO 1970 THE COUNTY POPULATION DECREASED BY 0.2 PERCENT WHILE THE STATE POPULATION INCREASED BY 10.2 PERCENT (TABLE 2). POPULATION PER SQUARE MILE OF THE COUNTY WAS 34.0 IN 1970. COMPARABLE DATA FOR MARSHALL AND ITS FOUR LARGER TOWNS IS PRESENTED IN TABLE 3.

AGRICULTURE IS THE MAJOR USE OF LAND IN THE COUNTY, ACCOUNTING FOR 87.1 PERCENT OF THE TOTAL AREA. IN 1973 THE COUNTY HAD 689 FARMS COVERING 217,294 ACRES. THE FARM POPULATION WAS 2,949 IN 1970; A 21.1 PERCENT DECREASE FROM 1960. RURAL NON-FARM POPULATION IN 1973 WAS 7,743. MAJOR CROPS HARVESTED IN 1972 WERE: CORN (89,158 ACRES), SOYBEANS (52,835 ACRES), ALFALFA (4,926 ACRES) AND OATS (4,203 ACRES).

WATER RESOURCES

THERE ARE 114 ARTIFICIAL IMPOUNDMENTS IN MARSHALL COUNTY RANGING IN SIZE FROM 0.1 ACRE TO 220.0 ACRES (TABLE 4). TOTAL ACREAGE OF ARTIFICIAL IMPOUNDMENTS IS 340.35 ACRES. IN ADDITION TO ARTIFICIAL IMPOUNDMENTS, THERE ARE 24 NATURAL LAKES. THE MAJORITY OF THESE ARE ILLINOIS RIVER BACKWATER LAKES AND DUE TO THEIR SHALLOW DEPTH (AVERAGE 3-4 FEET) MANY ARE NOT NAVIGABLE BY BOAT DURING LOW WATER PERIODS. TOTAL NATURAL LAKE ACREAGE IS 5,750.20 ACRES.

THERE ARE SIX MAJOR STREAMS IN THE COUNTY WITH A TOTAL SURFACE AREA OF 2,754.3 ACRES (TABLE 5). THESE STREAMS TOTAL 110 MILES IN LENGTH THROUGHOUT MARSHALL COUNTY. THE MOST IMPORTANT STREAMS FOR RECREATION ARE THE ILLINOIS RIVER, BIG SANDY CREEK, AND CROW CREEK (EAST).

CONSTRUCTION OF NEW WATER AREAS IN THE PAST HAS GENERALLY BEEN LIMITED TO FARM PONDS. DATA FURNISHED BY THE SOIL CONSERVATION SERVICE DEMONSTRATES THAT ONLY ONE SOIL CONSERVATION SERVICE POND (2.0 ACRES) HAS BEEN CONSTRUCTED IN THE COUNTY DURING THE PAST FIVE YEARS.

LAKE MORPHOMETRY AND ORIGIN

THE GREAT MAJORITY OF THE 138 IMPOUNDMENTS IN MARSHALL COUNTY ARE MAN-MADE AND MOST WERE FORMED BY BUILDING EARTHEN DAMS ACROSS DRAINAGE WATERWAYS. OTHER TYPES OF ARTIFICIAL IMPOUNDMENTS IN THE COUNTY ARE GRAVEL PIT LAKES RESULTING FROM GRAVEL MINING, AND BORROW PIT LAKES FORMED BY SOIL EXCAVATION FOR ROADWAY CONSTRUCTION. NATURAL LAKES ACCOUNT FOR 17.4 PERCENT OF THE TOTAL NUMBER AND 94.4 PERCENT OF THE TOTAL IMPOUNDMENT ACREAGE.

LAKE WILDWOOD, AN ARTIFICIAL IMPOUNDMENT OF 220 ACRES, IS THE DEEPEST LAKE (72 FEET) IN THE COUNTY. THE LARGEST LAKE IS THE BABBS SLOUGH - SAWYER SLOUGH COMPLEX (1,875.0 ACRES) WHICH FORMS A PROTION OF THE STATE OWNED MARSHALL COUNTY CONSERVATION AREA.

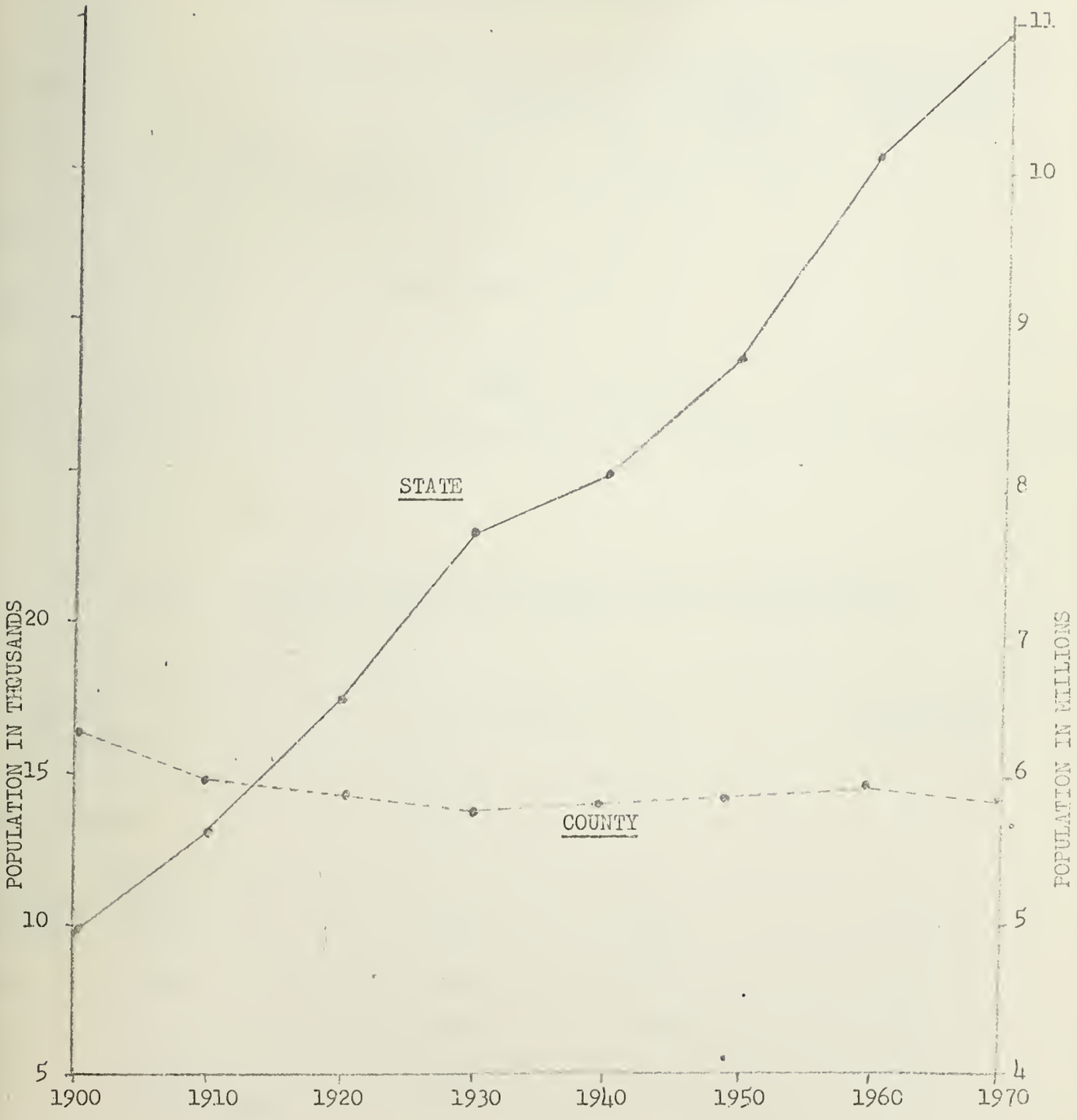


FIGURE 6 . MARSHALL COUNTY AND STATE OF ILLINOIS POPULATIONS FROM 1900-1970.

Source of data: Census of Population (1900-1970). Illinois.

TABLE 2. POPULATION AND LAND AREA COMPARISON OF MARSHALL COUNTY TO THE STATE OF ILLINOIS

County and State	Area (Sq. Miles)	Population 1960	Population 1970	Percent Change 1960-1970	Population Per Square Mile 1970 Census
arshall ounty	391	13,334	13,302	-0.2	34.0
tate of llinois	55,748	10,081,158	11,113,976	+10.2	199.4

Source: 1970 Census of Population. Number of Inhabitants. Illinois.

TABLE 3. POPULATION AND PERCENT CHANGE BETWEEN 1960-1970 FOR MARSHALL COUNTY AND TOWNSHIPS CONTAINING MAJOR CITIES

County and Township	Major City	Population 1960	Population 1970	Percent Change 1960-1970
arshall County		13,334	13,302	-0.2
ownship	Major City			
ennington	Toluca	1,352	1,319	-2.4
vans	Wenona	1,005	1,080	+7.5
enry	Henry	2,278	2,610	+14.6
acon	Lacon (county seat)	2,175	2,147	-1.3

Source: 1970 Census of Population. Number of Inhabitants. Illinois.

TABLE 4 . SUMMARY OF MARSHALL COUNTY IMPOUNDMENTS

Size	Artificial		Natural	
	Number	Acreage	Number	Acreage
0.1 - 0.4	53	13.50	4	0.90
0.5 - 0.9	33	19.60	1	0.70
1.0 - 5.9	24	45.75	5	12.60
6.0 - 10.9	1	8.00	1	10.00
11.0 - 40.9	2	33.50	5	99.00
41.0 - 100.9	--	--	3	160.00
101.0 - 500.9	1	220.00	--	--
501+	--	--	5	5467.00
Total	114	340.35	24	5750.20

TABLE 5. SUMMARY OF MAJOR STREAMS IN MARSHALL COUNTY

Name	Ave. Width (ft.)	Length in Co. (miles)	Acreage
Big Sandy Creek	45.0	16.5	91.3
Crow Creek (East)	33.3	40.0	155.6
Crow Creek (West)	20.0	20.0	48.4
Illinois River	1106.3	18.0	2413.8
Senachwine Creek	26.3	11.5	36.7
Snag Creek	17.5	4.0	8.5
Total		110.0	2754.3

Water Quality

The waters of Marshall County are, in general, hard, fertile, and very productive. With 81.7 percent of the county in farmland, virtually all streams and impoundments receive runoff from cultivated fields. During 1971 Illinois Department of Conservation fishery biologists sampled representative portions of the surface waters in each county in Illinois. The alkalinity of streams in Marshall County averaged 159 ppm (parts per million) with a range of 138-178 ppm. County impoundments averaged 123 ppm (range 71-168 ppm). Illinois EPA (Environmental Protection Agency) tests (1973) have shown the alkalinity in the Illinois River at Peoria to range from 88 to 237 ppm. Alkalinity provides a rough index of fertility of streams and lakes. Total Alkalinity is a measure of the carbonate content of waters and also expresses its buffering capacity. Interpretation for alkalinity readings of 100 ppm+ is as follows (Lopinot, 1972):

> Water is hard. Usually has good plankton blooms and extensive growths of aquatic plants. It is often highly productive for fish.

There has generally been very little water quality monitoring of surface waters within Marshall County. Data is available for the Illinois River, however, and important water quality constituents are discussed below as this waterway is of paramount importance to the county:

Dissolved Oxygen: This is one of the most important indicators of water quality. Adequate dissolved oxygen (DO) levels are necessary to support fish and other forms of aquatic life. Introducing significant amounts of organic wastes degrades a stream, creates odor nuisance, and eliminates aquatic biota. Reduced DO levels may not kill fish but might stress them to the point where they become less competitive, less tolerant to certain pollutants, and less efficient in productivity. The water quality standards of Illinois (1972) state that "dissolved oxygen shall not be less than 6.0mg/l (milligrams per liter) during at least 16 hours of any 24-hour period, nor less than 5.0 mg/l at any time. It has been well documented in past years that this criterion is usually not satisfied in many areas of the Illinois River. Higher than normal river flows during the past few years has resulted in a general increase in DO content in the river. Eleven DO analyses of the Illinois River at Lacon by the Illinois EPA (1973) showed a DO range of 2.4-12.0 ppm (mean value-8.2 ppm). Principal areas of contribution of oxygen demanding materials are the Chicago and Peoria-Pekin urban centers.

Turbidity: Turbidity is a condition of water resulting from the presence of suspended material (e.g. silt, plankton, dissolved organic matter). Increased turbidity decreases photosynthetic activity and thus biological productivity is reduced. At one time, the Illinois River was characterized as being clear (Mills, et al., 1966). The river has always carried a silt load, but prior to intensive human development of the Illinois River Basin it was surely a nominal problem. The turbidity tends to increase throughout the course of the river as it receives increasing sediment loads from the upper to lower segments of the basin. The major cause of the high turbidity of the river is agricultural activities. Suspended silt is undoubtedly the cause for the disappearance of aquatic vegetation from the Illinois River (Bellrose, personal communication). High water turbidity also

ADVERSELY AFFECTS THE WELL-BEING OF THE AQUATIC FAUNA.

TEMPERATURE: TEMPERATURE HAS A MARKED EFFECT ON THE SANITARY AND ECOLOGICAL CHARACTERISTICS OF A STREAM. THE SOLUBILITY OF OXYGEN IN WATER IS INVERSELY PROPORTIONAL TO WATER TEMPERATURE. TEMPERATURE INCREASE ALSO ACCELERATES THE RATE AT WHICH BIOLOGICAL LIFE USES OXYGEN. FOR EVERY 18°F. INCREASE IN TEMPERATURE, THE CHEMICAL REACTION RATE IS APPROXIMATELY DOUBLED IN AN ORGANISM OR IN AN ENVIRONMENT. HIGH TEMPERATURES ARE OFTEN ENCOUNTERED IN THE SHALLOW SILTED BACKWATERS OF THE ILLINOIS RIVER DURING THE SUMMER MONTHS. IN REGARD TO THERMAL POLLUTION, WAPORA (1974) DETERMINED THAT THE THERMAL DISCHARGES FROM THREE POWER PLANTS (HAVANA, HENNEPIN, AND MEREDOSIA) HAD NO ADVERSE EFFECTS ON DISSOLVED OXYGEN LEVELS AND PRODUCED NO MEASURABLE CHANGES IN THE BIOTA. HOWEVER, THE POTENTIAL FOR THERMAL POLLUTION EXISTS (AS WELL AS POTENTIAL FOR RADIOACTIVE WASTES IN NUCLEAR PLANTS) AND THESE PLANTS MUST BE MONITORED CLOSELY.

AMMONIA: AMMONIA IS A PRODUCT OF THE MICROBIOLOGICAL DECAY OF ANIMAL AND PLANT PROTEIN. MANY FERTILIZERS ALSO CONTAIN AMMONIA. AMMONIA IS OFTEN USED AS AN INDICATOR OF THE FRESHNESS OF SEWAGE. AMMONIA IS CAPABLE OF EXERTING A SIGNIFICANT OXYGEN DEMAND IN SURFACE WATERS. CONCENTRATIONS OF AMMONIA NITROGEN OF 1.0 PPM OR MORE MAY INDICATE ORGANIC POLLUTION AND 2.5 PPM MAY BE LETHAL TO FISH AND ZOOPLANKTON. DURING PAST YEARS, SUBSTANTIAL AMOUNTS OF AMMONIA HAVE BEEN DOCUMENTED IN THE ILLINOIS RIVER. MEAN VALUE FOR AMMONIA IN 1973 AT LACON (ILLINOIS EPA, 1973) WAS 0.56 PPM (RANGE 0.0-1.6 PPM).

NUTRIENTS: ALTHOUGH LEVELS OF AMMONIA, NITRATE, AND PHOSPHATE ARE HIGH IN THE ILLINOIS RIVER, ALGAL BLOOMS AND FILAMENTOUS ALGAE ARE LARGELY ABSENT DUE TO THE HIGH TURBIDITY LEVEL. THE POTENTIAL FOR EUTROPHICATION IS PRESENT, HOWEVER, DUE TO MUNICIPAL AND INDUSTRIAL WASTE AND AGRICULTURAL FERTILIZER AND WASTE RUNOFF.

pH: pH IS DEFINED AS THE LOGARITHM OF THE RECIPROCAL OF THE HYDROGEN ION CONCENTRATION. IN GENERAL, pH INDICATES WHETHER WATERS ARE ACIDIC, NEUTRAL (pH = 7), OR BASIC. A pH RANGE OF 5-9 IS USUALLY NOT LETHAL FOR MOST FRESHWATER FISH. MEASUREMENTS OF pH AT LACON IN 1973 BY THE ILLINOIS EPA SHOWED AN AVERAGE VALUE OF 8.0 (RANGE 7.3-8.3). THESE VALUES ARE WELL WITHIN OPTIMUM RANGE FOR FISH LIFE.

HEAVY METALS: LOCALIZED AREAS OF SIGNIFICANT METAL CONCENTRATIONS HAVE BEEN DOCUMENTED IN THE ILLINOIS RIVER. HOWEVER, ACKERMAN (1971) PRESENTED DATA SHOWING THAT LEVELS OF HEAVY METALS IN THE ILLINOIS RIVER AT PEORIA PRESENTED NO PUBLIC HEALTH HAZARD.

INSECTICIDES: STARRETT (1972) ESTIMATES THAT IN 1965 ABOUT 1,200 METRIC TONS OF SOIL INSECTICIDES AND ABOUT 100 METRIC TONS OF FOLIAR INSECTICIDES WERE APPLIED ON THE CROPLANDS OF THE BASIN OF THE ILLINOIS RIVER. DURING 1974 THE ILLINOIS EPA TOOK FISH FLESH SAMPLES AT VARIOUS RIVER LOCATIONS TO DETERMINE THEIR UPTAKE OF THESE POLLUTANTS. RESULTS OF THAT STUDY ARE NOT YET AVAILABLE. THERE CAN BE NO DOUBT, HOWEVER, THAT PESTICIDES HAVE RESULTED IN FLORAL AND FAUNAL DEGRADATION IN THE ILLINOIS RIVER.

FECAL COLIFORMS: COLIFORM BACTERIA ARE FOUND IN THE FECAL MATTER OF ALL WARM-BLOODED ANIMALS, INCLUDING MAN. THE PRESENCE OF THIS COLIFORM BACTERIAL GROUP HAS LONG BEEN USED TO INDICATE THE POSSIBILITY OF

pathogenic bacteria (Peterson, 1967). Large numbers of fecal coliforms in many areas of the Illinois River have been confirmed by EPA monitoring. In 1973, number of fecal coliforms at Lacon ranged from 0-500 per 0.1 liter (average 11 per 0.1 liter). Illinois EPA standards (1972) state that no effluent shall exceed 400 fecal coliforms per 0.1 liter. According to the Illinois EPA, Peoria is the only municipality along the Illinois River which obtains a portion of its public drinking supply from the Illinois River.

Most of the impoundments in Marshall County (except for the shallow backwater lakes) are stratified during the summer months due to turbidity and a rich organic bottom. Stratification occurs during winter months due to ice and snow cover. During periods of stratification, there is little or no oxygen in the deeper portions of these water areas. Complete mixing occurs only during spring and fall turnover when water temperatures are the same throughout the lake.

It is this phenomenon of stratification which prevents the successful stocking of trout in the great majority of our lakes. Trout prefer a temperature of 50-68°F., depending upon the species. Illinois lakes generally have little or no oxygen at the depths where these suitable temperatures are found during July, August and September.

Fisheries

The fishery fauna of Marshall County consists of approximately 71 warmwater species (Table 6). No rare or endangered species are known to occur.

A 1965 state-wide survey of Illinois anglers showed that largemouth bass was the preferred species of Marshall County fishermen (Lopinot, 1967). Crappie and bluegill were the next most desired species. However, anglers did not catch these preferred species as often as they did catfish.

The sport fishery in Marshall County is limited mainly to largemouth bass, bluegill, crappie, and catfish (channel, flathead, and bullheads). Largemouth bass, bluegill, and channel catfish are the predominant game fish species present in artificial impoundments. The Illinois River, bisecting the county, receives the heaviest stream fishing pressure. Fish species most often caught are largemouth bass, bluegill, crappie, channel catfish, bullheads, carp, and freshwater drum. Smallmouth bass are often taken in smaller streams such as Big Sandy Creek and Crow Creek (East), and at certain locations in the Illinois River (e.g. the abandoned Henry Lock).

The commercial fishery of the Illinois River peaked in 1908 when approximately 24 million pounds of fish (primarily carp) were harvested. During 1973, 13 full-time and 56 part-time commercial fishermen caught 400,771 pounds (carp - 212,953 pounds; buffalo - 117,828 pounds; channel catfish - 45,429 pounds: bullheads - 15,113 pounds; and freshwater drum - 7,239 pounds) from the entire Illinois River. During 1950 nearly 3 million pounds of fish were harvested from the Peoria Pool compared to 26,000 pounds in 1973. Calculated value of the 1973 Peoria Pool catch was $3,406. Pollution and habitat destruction (drainage activities) are responsible for the dramatic decline in the quality and quantity of the Illinois River fishery.

Wetlands

Wetlands in Marshall County are found primarily in the Illinois River bottoms. Prior to the turn of the century, man began to drain and levee off the river from

TABLE 6

A LIST OF ALL FISHES KNOWN TO OCCUR IN MARSHALL COUNTY

Polyodon spathula	Paddlefish
Lepisosteus osseus	Longnose gar
Lepisosteus platostomus	Shortnose gar
Amia calva	Bowfin
Anguilla rostrata	American eel
Alosa chrysochloris	Skipjack herring
Dorosoma cepedianum	Gizzard shad
Hiodon alosoides	Goldeye
Hiodon tergisus	Mooneye
Esox americanus	Grass pickerel
Esox lucius	Northern pike
Campostoma anomalum	Stoneroller
Carassius auratus	Goldfish
Cyprinus carpio	Carp
Nocomis biguttatus	Hornyhead chub
Notemigonus crysoleucas	Golden shiner
Notropis atherinoides	Emerald shiner
Notropis chrysocephalus	Striped shiner
Notropis cornutus	Common shiner
Notropis dorsalis	Bigmouth shiner
Notropis hudsonius	Spottail shiner
Notropis lutrensis	Red shiner
Notropis rubellus	Rosyface shiner
Notropis stramineus	Sand shiner
Notropis umbratilis	Redfin shiner
Phenacobius mirabilis	Suckermouth minnow
Phoxinus erythrogaster	Southern redbelly dace
Pimephales notatus	Bluntnose minnow
Pimephales promelas	Fathead minnow
Rhinichthys atratulus	Blacknose dace
Semotilus atromaculatus	Creek chub
Carpiodes carpio	River carpsucker
Carpiodes cyprinus	Quillback
Carpiodes velifer	Highfin carpsucker
Catostomus commersoni	White sucker
Erimyzon oblongus	Creek chubsucker
Hypentelium nigricans	Northern hog sucker
Ictiobus bubalus	Smallmouth buffalo
Ictiobus cyprinellus	Bigmouth buffalo
Moxostoma anisurum	Silver redhorse
Moxostoma erythrurum	Golden redhorse
Moxostoma macrolepidotum	Shorthead redhorse
Ictalurus melas	Black bullhead
Ictalurus natalis	Yellow bullhead
Ictalurus nebulosus	Brown bullhead
Ictalurus punctatus	Channel catfish
Noturus flavus	Stonecat
Pylodictis olivaris	Flathead catfish

TABLE 6 (CONT'D.)

MORONE CHRYSOPS	WHITE BASS
MORONE MISSISSIPPIENSIS	YELLOW BASS
AMBLOPLITES RUPESTRIS	ROCK BASS
LEPOMIS CYANELLUS	GREEN SUNFISH
LEPOMIS GIBBOSUS	PUMPKINSEED
LEPOMIS HUMILIS	ORANGESPOTTED SUNFISH
LEPOMIS MACROCHIRUS	BLUEGILL
LEPOMIS MICROLOPHUS	REDEAR SUNFISH
MICROPTERUS DOLOMIEUI	SMALLMOUTH BASS
MICROPTERUS SALMOIDES	LARGEMOUTH BASS
POMOXIS ANNULARIS	WHITE CRAPPIE
POMOXIS NIGROMACULATUS	BLACK CRAPPIE
LEPOMIS GULOSUS	WARMOUTH
ETHEOSTOMA FLABELLARE	FANTAIL DARTER
ETHEOSTOMA NIGRUM	JOHNNY DARTER
ETHEOSTOMA SPECTABILE	ORANGETHROAT DARTER
PERCA FLAVESCENS	YELLOW PERCH
PERCINA CAPRODES	LOGPERCH
PERCINA MACULATA	BLACKSIDE DARTER
PERCINA PHOXOCEPHALA	SLENDERHEAD DARTER
STIZOSTEDION CANADENSE	SAUGER
STIZOSTEDION VITREUM	WALLEYE
APLODINOTUS GRUNNIENS	FRESHWATER DRUM

COMMON AND SCIENTIFIC NAMES - SMITH, 1973

SPECIES LIST - DIVISION OF FISHERIES DISTRICT FILES (ROANOKE)

ITS BOTTOMLAND LAKES AND MARSHES FOR AGRICULTURAL PURPOSES. ORIGINALLY THERE WERE 400,000 ACRES IN THE RIVER FLOODPLAIN BETWEEN LA SALLE AND GRAFTON. MOST OF THE DRAINING WAS DONE BETWEEN 1903 AND 1920 (STARRETT, 1972). ALTOGETHER 200,000 ACRES WERE DRAINED, OF WHICH ABOUT 8,000 ACRES WERE ABANDONED AND RESTORED AS LAKES (MILLS, ET AL., 1966).

LOSS OF THESE LAKES AND MARSHES HAS HAD AN OVERPOWERING DETRIMENTAL EFFECT ON THE FISH AND WILDLIFE IN THE ILLINOIS RIVER VALLEY. THESE HABITAT TYPES PROVIDED SPAWNING GROUNDS FOR FISH SPECIES SUCH AS NORTHERN PIKE, LARGEMOUTH BASS, AND THE YELLOW PERCH AND FEEDING AND RESTING AREAS FOR MIGRATORY WATERFOWL (STARRETT, 1972). THESE HABITAT TYPES, LONG KNOWN FOR THEIR BIOTIC PRODUCTIVITY, ALSO SERVE IN THEIR UNALTERED STATE TO STORE FLOODWATERS, NUTRIENTS, AND SEDIMENT.

PUBLIC USE AND ACCESS

PUBLIC LANDS WITH WATER FRONTAGE IN MARSHALL COUNTY IS LISTED IN TABLE 7. THE ILLINOIS RIVER IS OPEN TO PUBLIC RECREATION AND IS HEAVILY USED BY FISHERMEN AND BOATERS. MAIN PUBLIC RIVER ACCESS POINTS IN THE COUNTY ARE MARSHALL COUNTY CONSERVATION AREA, SPARLAND CONSERVATION AREA, LACON HARBOR, AND HENRY LANDING. ALL OTHER STREAMS IN THE COUNTY ARE PRIVATELY OWNED AND ACCESS IS RESTRICTED TO BRIDGES OR BY PERMISSION OF THE LANDOWNER(S).

THE STATE-OWNED MARSHALL COUNTY CONSERVATION AREA RECEIVES THE GREATEST PUBLIC USAGE OF ANY COUNTY FACILITY. 55,700 PEOPLE UTILIZED THIS AREA IN 1974. COMPARATIVE ATTENDANCE FIGURES FOR MARSHALL COUNTY CONSERVATION AREA AND THE STATE OF ILLINOIS IS GIVEN IN TABLE 8.

COTTAGE AND HOMESITE DEVELOPMENT

SUMMER COTTAGES AND YEAR-ROUND HOMESITES ARE FOUND ALONG THE ILLINOIS RIVER IN MARSHALL COUNTY. CURRENTLY, ONLY TWO IMPOUNDED SURFACE WATERS HAVE COTTAGE OR HOMESITE DEVELOPMENT ALONG THE SHORELINE. LAKE WILDWOOD (220 ACRES) AND LAKE TANGLEWOOD (14 ACRES), ORGANIZATIONALLY OWNED LAKES NEAR VARNA, WILL EVENTUALLY HAVE APPROXIMATELY 1,866 HOMESITES.

TABLE 7 . PUBLIC LAND WITH WATER FRONTAGE IN MARSHALL COUNTY

Name of Area	Ownership	Legal Description	Land Area (acres)	Water Frontage (mi.)	Water Name
Marshall Co. Cons. Area	State of Illinois	T29N,R3W Sec. 22	565.15	12.0	Illinois River (Babbs-Big Meadow Sloughs)
Sparland Cons. Area	State of Illinois	T12N,R9E Sec. 2	180.60	3.0	Illinois River (Goose Lake)
Cameron Div. Chautauqua Nat. Wildlife Refuge	U.S.A.	T13N,R10E Sec. 31	---	1.0	Illinois River (Weis Lake)
Lacon Harbor	City of Lacon	T30N,R3W Sec. 35	---	0.3	Illinois River
Henry Landing	City of Henry	T13N,R10E Sec. 16	---	0.2	Illinois River

TABLE 8 . TOTAL ATTENDANCE FIGURES FOR MARSHALL CO. CONS. AREA AND STATE RECREATIONAL AREAS

Year	Marshall Co. Cons. Area	State of Illinois
1970	16,025	24,033,265
1971	23,300	26,342,627
1972	47,200	25,745,988
1973	49,607	25,050,731
1974	55,700	25,930,977

Source of Data: Illinois Division of Parks and Memorials, Springfield

PRESENT AND POTENTIAL USES OF SURFACE WATER

This section discusses the present uses of surface waters in Marshall County and what is needed to better meet the growing recreational demand. Evaluation of the water related uses of fishing, boating, swimming, hunting, trapping, and aesthetics are presented.

Fishing (Sport and Commercial)

There were 1,754 fishing licenses (13.2 percent of the county population) sold in Marshall County during 1972. As no license is required of owners or tenants who fish waters on the land where they reside and no license is required for persons under 16 years of age, it is evident that the number of licenses sold does not reflect the true picture of the actual number of county residents who fish. In a 22 year period ending in 1972, more fishing licenses were sold in 1956 (2,091) than in any other year. Sales during the period 1963-1972 were fairly constant (Fig. 7).

Fishing naturally depends on the availability of fishing waters. There is a paucity of artificial impoundments in Marshall County but fortunately the Illinois River traverses the county. The great bulk of fishing occurs in the Illinois River and its backwater lakes. The Illinois River proper and two state-owned backwater areas (Sparland and Marshall County Conservation Areas) provide 6,070.8 acres of public fishing in the county. Additional backwaters listed as "public" in a State of Illinois 1916 listing are Whitman Lake, Gar Lake, Fisher's Slough, and Median Slough. This study was brought to light during a 1973 evaluation of Peoria Lake by the Illinois Division of Waterways. Whether these lakes and sloughs remain classified as private or public will no doubt have to be settled in court.

Potential reservoirs of moderate size are available throughout most of Marshall County. Nine potential sites were studied by Dawes and Terstriep (1966 and are shown in Figure 8. Site No. 6 on Shaw Creek was constructed in 1968 (Lake Wildwood). With certain reservations, Dawes and Terstriep (1966) found all nine sites studied as feasible.

Commercial fishing is limited to the Illinois River. The Illinois River could regain a portion of its former stature as a good commercial fishery if water pollution abatement becomes a reality, there are no further major habitat alterations (e.g intensive floodplain drainage and development), and siltation from agricultural sources is brought under control. During 1974 there were but two Illinois River commercial fishermen (part-time) residing in Marshall County.

Boating

There are 16 private marinas located 40 miles in either direction of Peoria. Boating in Marshall County is almost exclusively confined to the Illinois River and its backwaters.

The numbers of Marshall County and State of Illinois boat registrations is listed in Table 9. There was no increase in county registrations during the 1962-1973 period while registrations for the entire state demonstrated a 68.5 percent increase. Existing boat launching sites for the Marshall County sector of the Illinois River are sufficient to meet county demands.

Swimming

The quality of the Illinois River prevents its legal use for contact water

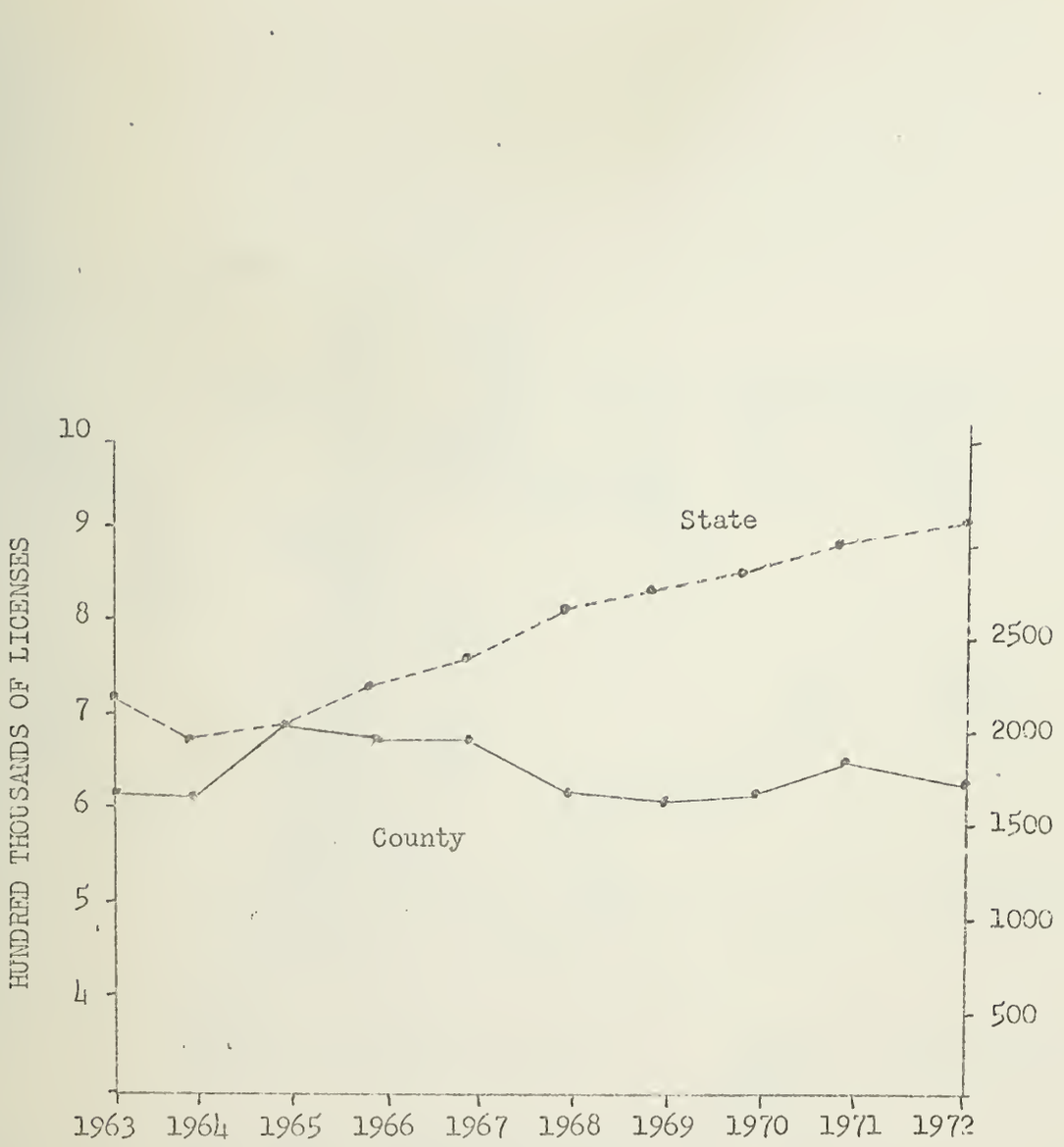
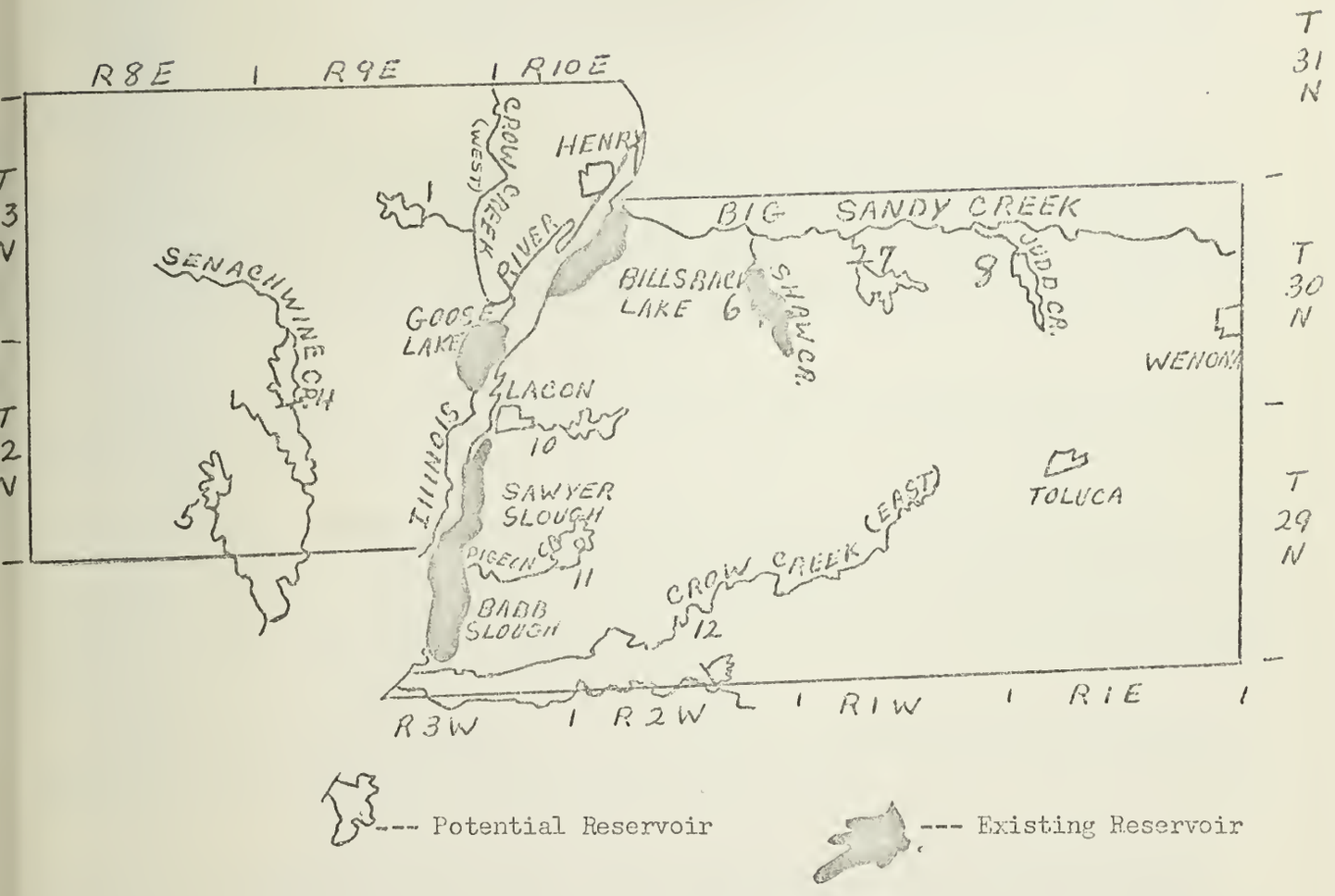


FIGURE 7. POLE AND LINE FISHING LICENSE SALES 1963 - 1972.
(Includes non-resident and over 65 licenses)

Source of data: Illinois Division of Fisheries (Springfield)

FIGURE 8 . POTENTIAL RESERVOIRS IN MARSHALL COUNTY



--- Potential Reservoir

--- Existing Reservoir

Site 1. Trib. Crow Creek -- SE¼ NE¼ 22-13N-9E Acres 109
Site 4. Senachwine Creek -- SW¼ SE¼ 7-12N-9E Acres 256
Site 5. Little Senachwine Creek -- SW¼ NE¼ 26-12N-8E Acres 235
*Site 6. Shaw Creek -- Ctr. SE¼ 12-30N-2W Acres 282
Site 7. Trib. Big Sandy Creek -- N. line 16-30N-1W Acres 160
Site 8. Judd Creek -- NE¼ SW¼ 7-30N-1E Acres 250
Site 10. Trib. Illinois River -- W. line 32-30N-2W Acres 77
Site 11. Pigeon Creek -- Ctr. SE¼ 18-29N-2W Acres 115
Site 12. Trib. Snag Creek -- SE¼ SW¼ 35-29N-2W Acres 64

* Lake Wildwood (220 acres)

Source of Data: Dawes and Terstriep (1967)

SPORTS. THERE ARE NO OFFICIAL GOVERNMENTAL SWIMMING AREAS ON THE SURFACE WATERS OF MARSHALL COUNTY (DOES NOT INCLUDE MUNICIPAL SWIMMING POOLS). ARTIFICIAL IMPOUNDMENTS AND STREAMS ARE USED RATHER FREQUENTLY FOR SWIMMING BY LANDOWNERS.

CAMPING

THE SOLE EXISTING GOVERNMENTAL CAMPING AREA IN MARSHALL COUNTY IS THE MARSHALL COUNTY CONSERVATION AREA WITH 40 CAMPSITES WITH ELECTRICITY. THERE ARE NO PRIVATE CAMPGROUNDS IN THE COUNTY. AN ADDITIONAL CAMPGROUND OR TWO WOULD PERHAPS PROVIDE A NEEDED ADDITION TO THE OUTDOOR RECREATIONAL PROGRAM. THE POPULARITY OF CAMPING (ALONG WITH HUNTING AND FISHING) IN MARSHALL COUNTY IS EASILY DEMONSTRATED BY THE 350 PERCENT INCREASE IN ATTENDANCE AT THE MARSHALL COUNTY CONSERVATION AREA FROM 1970-1974 (TABLE 8).

HUNTING AND TRAPPING

HUNTING IN ILLINOIS HAS, FOR YEARS, PROVIDED A VALUABLE SOURCE OF RECREATION FOR LARGE SEGMENTS OF THE ILLINOIS POPULATION (APPROXIMATELY 500,000 ANNUALLY). FIGURE 9 SHOWS THE HUNTING LICENSE SALES TREND FOR MARSHALL COUNTY AND THE STATE OF ILLINOIS FROM 1963 THROUGH 1972. NUMBERS OF LICENSES SOLD IN 1963 WAS APPROXIMATELY EQUAL TO THE NUMBERS SOLD DURING 1972 AT BOTH THE STATE AND COUNTY LEVEL. THE DECREASE SHOWN FOR 1968 IS THOUGHT TO BE DUE TO IMPLEMENTATION OF THE ILLINOIS FIREARM OWNERS IDENTIFICATION ACT THAT YEAR.

WATERFOWL HUNTING IN THE COUNTY IS FAIR WITH MOST BEING DONE ALONG THE ILLINOIS RIVER. PUBLIC WATERFOWL HUNTING OPPORTUNITIES EXIST AT THE SPARLAND AND MARSHALL COUNTY CONSERVATION AREAS.

DEER HUNTING RESUMED IN ILLINOIS IN 1957 AFTER A LAPSE OF 56 YEARS. ONLY TEN WHITE TAIL DEER WERE SHOT IN MARSHALL COUNTY (1,735 STATEWIDE) DURING 1975 (CALHOUN AND LOOMIS, 1974). THE HARVEST HAS INCREASED DRAMATICALLY OVER THE YEARS AND IN 1974 A RECORD 13,879 DEER (173 IN MARSHALL COUNTY) WERE TAKEN DURING THE SIX-DAY SHOTGUN SEASON. IN 1975, 97 COUNTIES (62,000 PERMITS) WILL BE OPEN TO WHITETAIL SHOTGUNNERS. 900 PERMITS WILL BE ALLOTTED TO MARSHALL COUNTY.

DURING THE PERIOD 1956-1969, THE MEAN NUMBER OF ANIMALS (COMBINED TOTAL OF MOURNING DOVES, PHEASANTS, BOBWHITES, SQUIRRELS, AND COTTONTAILS) KILLED IN MARSHALL COUNTY WAS 1.8 PER HUNTER-TRIP (PRENO AND LABISKY, 1971).

TRAPPING OF FURBEARING ANIMALS (MAINLY MUSKRAT, BEAVER AND MINK) FROM THE STREAMS AND IMPOUNDMENTS IN ILLINOIS HAS DECLINED PRECIPITOUSLY DURING THE PAST 25 YEARS (TABLE 10). IN 1950 THERE WERE 17,388 LICENSED TRAPPERS (106 IN MARSHALL COUNTY) WHILE IN 1972 THERE WERE ONLY 7,331 (33 IN MARSHALL COUNTY). THE ILLINOIS FUR TRADE HAS, HOWEVER, REMAINED RELATIVELY STABLE SINCE 1954.

AESTHETICS

THE AESTHETIC EXPERIENCE IS PART AND PARCEL WITH THE OUTDOOR ACTIVITIES DISCUSSED ABOVE. THE TRUE VALUE OF AN ANGLING OR CAMPING TRIP IS THE CONTRAST VALUE THAT THE TRIP PROVIDES. LACK OF AESTHETIC VALUE MEANS LACK OF CONTRAST AND A NON-QUALITY OUTDOOR EXPERIENCE. THOSE WHO TRAVEL 100 MILES TO A CROWDED CAMPGROUND THEN SPEND THE ENTIRE WEEKEND WATCHING TELEVISION IN AN AIR-CONDITIONED CAMPER KNOW NOTHING OF AESTHETICS. TOO MUCH SO-CALLED "DEVELOPMENT" AT OUR STATE AND PRIVATE RECREATIONAL AREAS ULTIMATELY DESTROYS THE VERY RESOURCE WE ARE TRYING TO PROTECT. IN THE WORDS OF ALDO LEOPOLD (1970), "RECREATIONAL DEVELOPMENT IS A JOB NOT OF BUILDING ROADS INTO LOVELY COUNTRY, BUT A BUILDING RECEPTIVITY INTO THE STILL UNLOVELY HUMAN MIND."

NATURAL RESOURCE AESTHETIC VALUES IN MARSHALL COUNTY ARE DECLINING DUE TO IRRESPONSIBLE POLLUTION, STREAM CHANNELIZATION, AND ANTI-SOIL CONSERVATION AGRICULTURAL PRACTICES. THIS TREND WILL SURELY CONTINUE AS THE STATE'S POPULATION EXPANDS UNLESS MAN REALIZES THAT RESOURCE MANAGEMENT ENTAILS A GREAT MANY RESPONSIBILITIES, NOT MERELY PRIVILEGES.

TABLE 9 . STATE AND COUNTY BOAT LICENSES 1962 - 1973.

Year	Marshall Co.	State of Illinois
1962	364	141,751
1963	378	152,198
1964	362	151,081
1965	358	156,132
1966	335	154,812
1967	341	165,341
1968	372	187,518
1969	395	197,129
1970	304	171,469
1971	329	184,560
1972	342	196,006
1973	365	209,354

Source of Data: Illinois Division of Fisheries, Springfield

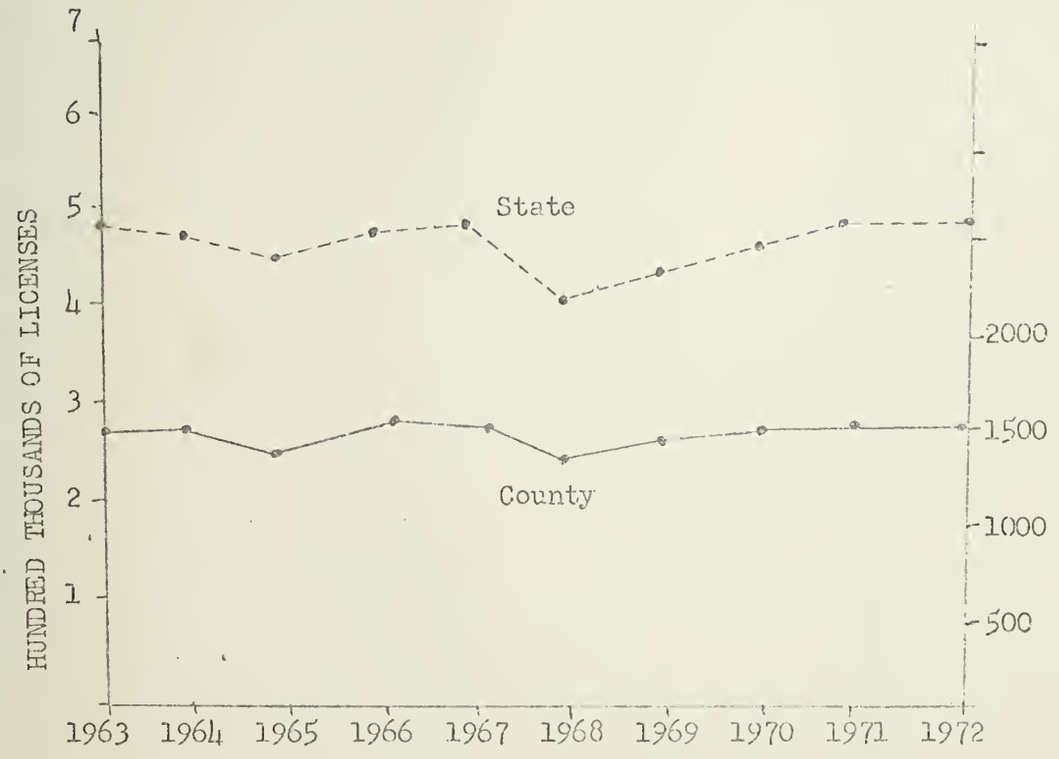


FIGURE 9 . HUNTING LICENSE SALES 1963 - 1972.
(Includes non-resident and over 65 licenses)

Source of data: Illinois Division of Wildlife Resources (Springfield)

TABLE 10. STATE AND COUNTY TRAPPING LICENSE SALES
1950 - 1972

Year	Total County Sales	Total State Sales
1950	106	17,388
1951	--	--
1952	--	--
1953	70	10,977
1954	74	8,347
1955	65	7,284
1956	46	7,250
1957	21	6,143
1958	19	5,259
1959	18	5,238
1960	24	6,535
1961	23	6,416
1962	24	7,171
1963	27	7,193
1964	17	5,735
1965	23	5,931
1966	22	6,270
1967	18	4,985
1968	17	5,416
1969	39	7,218
1970	18	6,574
1971	22	6,225
1972	33	7,331

Source of Data: Division of Wildlife Resources, Springfield

SURFACE WATER PROBLEMS

MAN HAS LONG MISUNDERSTOOD, MISUSED, AND ABUSED THE NATURAL RESOURCES OF THIS STATE AND COUNTRY. THE DEGREE OF THIS RESOURCE MALIGNING HAS BEEN DISCUSSED IN SOME DETAIL IN EARLIER SECTIONS OF THIS REPORT DEALING WITH THE ILLINOIS RIVER. ALTHOUGH SOME TERM THIS THE "DECADE OF ENVIRONMENTAL AWAKENING" OUR RIVERS AND AIR ARE STILL HEAVILY POLLUTED AND WE CONTINUE TO PAVE OVER ONE MILLION ACRES OF WILDLIFE HABITAT PER YEAR FOR UNNECESSARY HIGHWAYS AND UNPLANNED URBAN SPRAWL.

DISCUSSED BRIEFLY BELOW ARE THE MAJOR SURFACE WATER PROBLEMS MARSHALL COUNTY AND THE STATE OF ILLINOIS FACE TODAY.

POLLUTION AND FLUCTUATING WATER LEVELS

THE REALITY OF THE WATER POLLUTION PROBLEM IS EASILY REALIZED BY ANYONE WHO SPENDS TIME ON THE ILLINOIS RIVER. ALTHOUGH THERE ARE ENCOURAGING SIGNS OF FISHERY POPULATION INCREASES, THIS IMPROVEMENT MAY BE DUE MORE TO HIGH RIVER FLOWS THAN WATER QUALITY IMPROVEMENT PER SE. AT ANY RATE, THE ILLINOIS RIVER IS STILL HIGHLY POLLUTED WITH MUNICIPAL WASTES (MAINLY SEWAGE), INDUSTRIAL EFFLUENTS (OIL, ACIDS, HEAVY METALS, OXYGEN DEMANDING WASTES, ETC.), AND AGRICULTURAL RUNOFF (SILT, PESTICIDES, FERTILIZERS, AND LIVESTOCK WASTES). CONSTRICTED BY THE DRAINAGE OF 50 PERCENT OF ITS FLOODPLAIN AND BY LEVEE CONSTRUCTION, POLLUTANTS ARE NOW MORE HEAVILY CONCENTRATED IN THE ILLINOIS RIVER WATER AREAS THAT REMAIN. STEPS HAVE AND ARE BEING TAKEN TO CONTROL INDUSTRIAL AND MUNICIPAL POLLUTANTS. HOWEVER, NO SUCH ACTION HAS YET BEEN PROPOSED FOR AGRICULTURAL POLLUTANTS (EXCEPT FOR LARGER FEED LOT OPERATIONS).

ON A VOLUME BASIS, SILT IS THE MAJOR POLLUTANT IN ILLINOIS LAKES AND STREAMS. SHORT-SIGHTED FARMING PRACTICES (FARMING AND/OR PASTURING NON-SUITABLE LANDS, FALL PLOWING, STREAM DITCHING, EXCESSIVE DRAINAGE, ETC.) ARE PRIMARILY RESPONSIBLE FOR ACCELERATED SOIL EROSION PROBLEMS AND SUBSEQUENT STREAM SILTING. IT MUST BE REMEMBERED THAT STORM SEWERS RUNOFF, CONSTRUCTION SITES, GRAVEL MINING OPERATIONS, WATERWAY DREDGING, ETC. ALSO ADD TO THE PROBLEM AND ARE FREQUENTLY GUILTY OF CONTRIBUTING HEAVY LOADS OF SILT.

SILTATION HAS CAUSED THE DISAPPEARANCE OF VIRTUALLY ALL AQUATIC PLANT LIFE IN THE ILLINOIS RIVER. SILT PRESENTLY HAS THE REMAINING BACKWATER LAKES AND SLOUGHS BY THE THROAT. DEMISE OF THESE AREAS VIA SILTATION WILL MEAN NOT ONLY THE TRAGIC LOSS OF FISHERY HABITAT AND RECREATIONAL AREAS, BUT WILL RESULT IN EVER-INCREASING RIVER FLOWS AS WELL. THE LOSS OF WATER STORAGE CAPACITY WILL MEAN A FURTHER TAX BURDEN ON THE TAXPAYER WHO HAS TO PAY FOR FLOOD DAMAGES. SOME FLOOD DAMAGE IS UNAVOIDABLE AND TRAGIC. MOST, HOWEVER, IS DUE TO MAN'S IGNORANCE AND GREED IN HIS PASSION TO PERFORM CORRECTIVE SURGERY ON THE EARTH. THOSE WHO BUILD AND FARM ON FLOODPLAINS SHOULD TAKE THEIR LUMPS QUIETLY WHEN THEIR FEET GET WET - AFTER ALL, THE FLOODPLAIN BELONGS TO THE RIVER. WE HAVE SO CONSTRICTED AND DRAINED THE FLOODPLAIN THAT TODAY WHEN "FLOODS" DO OCCUR IT HAPPENS WITH LESS VOLUME OF FLOW THAN IN PAST YEARS.

PASTURING OF STEEP SLOPES AND ALLOWING LIVESTOCK UNLIMITED WATERWAY ACCESS IS A MAJOR PROBLEM IN MARSHALL COUNTY AND MANY OTHER AREAS IN THE STATE. THESE TYPES OF PRACTICES RESULT IN EROSION AND SUBSEQUENT STREAM SILTATION, NOT TO MENTION THE BONUS OF ADDITIONAL FECAL MATTER IN OUR WATERWAYS. ALDO LEOPOLD (1970) SUMMED UP THIS QUESTION WHEN HE SAID, "THERE HAS BEEN VISIBLE PROGRESS IN SUCH PRACTICES AS STRIP-CROPPING, PASTURE RENOVATION, AND SOIL LIMING, BUT NONE IN FENCING WOODLOTS AGAINST GRAZING, AND NONE IN EXCLUDING PLOW AND COW FROM STEEP SLOPES. THE FARMERS, IN SHORT, HAVE SELECTED THOSE REMEDIAL PRACTICES WHICH WERE PROFITABLE ANYHOW, AND IGNORED THOSE WHICH WERE PROFITABLE TO THE COMMUNITY, BUT NOT CLEARLY PROFITABLE TO

THEMSELVES. TO SUM UP: WE ASK THE FARMER TO DO WHAT HE CONVENIENTLY COULD TO SAVE HIS SOIL, AND HE HAS DONE JUST THAT, AND ONLY THAT. THE FARMER WHO CLEARS THE WOODS OFF A 75 PERCENT SLOPE, TURNS HIS COWS INTO THE CLEARING, AND DUMPS ITS RAINFALL, ROCKS, AND SOIL INTO THE COMMUNITY CREEK, IS STILL (IF OTHERWISE DECENT) A RESPECTED MEMBER OF SOCIETY."

THE TIDE OF THE ABOVE DISCUSSED PROBLEMS CAN INDEED BE TURNED IF WE WILL BUT COME OUT OF OUR CONSERVATION COMA. BASICALLY, THIS COMA HAS RESULTED FROM TOO MANY PEOPLE NOT CARING ABOUT WHAT HAPPENS TOMORROW SO LONG AS THEY CAN GRATIFY THEIR WISHES TODAY. UNLESS EACH PERSON SQUARELY FACES UP TO HIS INDIVIDUAL RESPONSIBILITY IN RESOURCE MANAGEMENT, THE WATER RESOURCES OF MARSHALL COUNTY AND ILLINOIS WILL STEADILY DETERIORATE.

THE FUTURE

THE FUTURE OF MARSHALL COUNTY WATER RESOURCES WILL BE JUST AS BRIGHT AS WE MAKE IT. IT APPEARS NECESSARY FOR THE STATE AND FEDERAL GOVERNMENT TO STRONGLY REGULATE AGRICULTURAL POLLUTANTS. SILT IS A POLLUTANT AND SHOULD BE REALIZED AS SUCH. TO DATE, VOLUNTARY AND COST-SHARING PRACTICES HAVE BUT SCRATCHED THE SURFACE OF THE SOIL CONSERVATION PROBLEM. EXACTING STATE AND FEDERAL SILT-POLLUTIONAL LAWS MAY BE THE ONLY MEANS LEFT IF WE ARE TO REMEDY THIS STAGGERING DILEMMA.

NECESSARY PRACTICES AND REGULATIONS WILL BE FORTHCOMING IF AND ONLY IF THE PUBLIC DEMANDS SUCH. IN CONTEMPLATING THE DECISION AS TO WHETHER YOU WILL PAY YOUR "PAST DUE" BILLS FOR RESOURCE ABUSE, REALIZE THAT CLEAN WATER, PRODUCTIVE LANDS, AND CLEAN AIR ARE STILL THE RAW ESSENTIALS OF LIFE.

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GLOSSARY

ACRE FOOT - An area of one acre covered to a depth of one foot. One acre foot is 43,560 cubic feet or 325,851 gallons of water.

AESTHETICS - The overall scenic attraction of a lake setting; natural beauty of shores and waters, or any unusual phenomena; the appeal of its wildlife and aquatic plants.

ALGAE BLOOM - A bloom of algae (microscopic plants) may be so dense that it imparts a greenish, yellowish or brownish color to the water.

ALKALINITY - Ordinarily expressed as a pH above 7. Most water in the alkaline class has a range from pH 7.6 to 10.0. Alkalinity may be expressed as the amounts of carbonates, bicarbonates and hydroxides present in the water.

ALLUVIUM - The sediments, or detrital matter, carried by inflowing streams and deposited on lake bottoms.

ANTICLINE - An arch of stratified rock in which layers bend downward in opposite directions from the crest.

AQUATIC PLANTS - Plants whose seeds germinate in the water or in the lake bottom soil; those that grow in water and are commonly grouped as floating, submersed and emersed.

AQUIFER - Any geological formation containing water, especially one which supplies the water for wells and springs.

ARTIFICIAL IMPOUNDMENT - Basins purposely excavated by man and filled with water by catchment from runoff, by pumping or by diversion of natural water bodies.

BASE FLOW - Flow in a stream when no runoff or precipitation is taking place.

BOD - The abbreviation for biochemical oxygen demand which is a measure of the amount of water soluble oxygen required by microscopic organisms to decompose a given amount of organic material in a specific amount of time.

COD - Abbreviation for chemical oxygen demand which is a measure of the chemically oxidizable organic matter in a given sample of water. The ratio between the BOD and COD is an indication of the relative proportion of biologically available organic matter in a given sample.

CARRYING CAPACITY - The maximum number (or weight) of organisms of a given species and quality which can survive in a given ecosystem through the least favorable environmental conditions that occur within a stated interval of time.

COMMERCIAL FISH - Fish that are caught by special tackle and sold.

CREEL CENSUS - Information obtained from anglers on their fishing success. A creel census can give information on fishing pressure, fishing quality, the total number and weight of fish being harvested, and the kind and size of fish being caught.

DERELICT LANDS - Those quarries, gravel pits and strip mines which have been abandoned or are depleted.

DO - An abbreviation for dissolved oxygen which is oxygen available in water for the survival of fish and other organisms.

DRAINAGE BASIN OR AREA - That part of a land area over which runoff water drains to a common point. See Watershed.

ECOLOGICAL - Pertaining to the interrelationship of living things and their environment.

ECOSYSTEM - A community of organisms, interacting with one another, plus the environment in which they live and with which they also interact; e.g. a pond, lake, or stream.

EPHEMERAL - Lasting a very short time; short-lived; as applied to water areas - short-lived lakes and ponds.

EPILIMNION - In a thermally stratified lake, the turbulent layer of water that extends from the surface to the thermocline.

ESKER - A serpentine ridge of gravelly and sandy drift, believed to have been formed by streams under or in glacial ice.

EUTROPHICATION - Enrichment of the water or lake soil. Increase in nutrients required for growth of organisms may come about by natural processes or rapid enrichment may take place due to some cause such as the introduction of sewage effluent. Eutrophic lakes are well provided with basic nutrients.

EVAPOTRANSPIRATION - The combined losses from a lake surface due to evaporation, sublimation and transpiration from plant life.

FLATS - Water with slight to moderate current and with an unbroken surface but less depth than pools.

FLOODPLAIN - That part of a lake or stream basin lying between the shoreline and the shore cliff and subject to submergence during a high water stage.

FLUVIAL - Pertaining to streams and rivers.

FORAGE FISH - All small size fish used as food by larger fish.

GLACIAL DRIFT - Material of any sort deposited in one place by glacial action after having been moved from another location.

GLACIAL LAKE - A lake formed as a result of glacial action.

GLACIAL OUTWASH - Deposits made of materials produced by glaciers and carried, sorted and deposited by water that originated mainly from the melting glacial ice. The deposits now exist as stratified beds of clay, sand or gravel in the form of plains, valley trains and deltas of old glacial lakes.

GLACIAL PLAINS - Glacial material that has been sorted or stratified by the meltwater of a glacier and is carried and deposited mainly as beds of clay, sand and gravel to form plains.

GLACIAL TILL - A deposit of unstratified earth, sand, gravel and boulders transported by glaciers.

GOB-PILE - The refuse area from a coal processing plant consisting of waste coal by-products. Rock material and soil.

GRADIENT - The inclination from the horizontal of the lake bottom beginning at the shoreline. The slope of a stream over a given distance.

GRAVEL PIT - Lakes or ponds formed by the excavation of gravel.

GROUND WATER TABLE - The upper limit of the part of the soil or underlying material wholly saturated with water.

HARDNESS (Water) - That quality in water which is imparted by the presence of dissolved salts, especially calcium sulfate or bicarbonate.

HOMOGENOUS - Composed of parts all of the same kind.

HYPOLIMNION - In a thermally stratified lake, the layer of water below the thermocline and extending to the bottom of the lake. The water temperature is virtually uniform.

IMPOUNDMENT - A body of water ponded or held back by a dam, dike, floodgate or any other barrier.

INTERMITTENT STREAM - A stream having water only part of the time.

KAME - A more or less rounded hill of sand and gravel associated with glacial deposits.

LACUSTRINE DEPOSIT - Materials deposited from lake water.

LAKE - A large body of water surrounded by land. The Illinois Department of Conservation classifies all impoundments six acres or larger as lakes.

LITTORAL ZONE - A narrow zone including both land and water immediately bordering the shoreline of a water area.

LOAM - A rich friable soil containing a relatively equal mixture of sand and silt and a somewhat smaller portion of clay.

LOESS - An unstratified deposit of yellowish-brown loam covering areas in North America, Europe and Asia, now generally thought to be chiefly a wind-borne deposit.

MARSH - An area where water stands the year-round and is usually abounding in water weeds, cattail, bulrushes and other emersed vegetation.

MGD - An abbreviation for million gallons per day.

MORAINE - A ridge, mound, or irregular mass of boulders, gravel, sand and clay deposited by a glacier.

MORPHOMETRY - Measurements such as depth, length, width, volume, shoreline and bottom gradients of a water area.

NATURAL LAKE - Any large impounded water area not formed by an act of man.

NURSERY STREAM - A tributary stream used by small fish for protection and feeding until they reach maturity.

OXBOW LAKE - A LAKE OCCUPYING THE ABANDONED CHANNEL OF A LOOPING MEANDER OF A RIVER.

PARAMETER - A CONSTANT OR VARIABLE TERM IN A FUNCTION THAT DETERMINES THE SPECIFIC FORM OF THE FUNCTION BUT NOT ITS GENERAL NATURE.

PERMEABLE SOILS - SOILS CAPABLE OF ALLOWING THE PASSAGE OF WATER. A POROUS SOIL.

pH - THE SYMBOL FOR THE LOGARITHM OF THE RECIPROCAL OF HYDROGEN ION CONCENTRATION IN GRAM ATOMS PER LITER. A pH OF LESS THAN 7.0 IS ACID, A pH OF 7 NEUTRAL AND MORE THAN 7.0 IS ALKALINE. pH INDICATES THE ACIDITY OR ALKALINITY OF A MATERIAL.

PHOTOSYNTHESIS - THE PROCESS BY WHICH GREEN PLANTS USE SUNLIGHT, CARBON DIOXIDE AND WATER TO PRODUCE CARBOHYDRATES AND OXYGEN.

PHYSIOGRAPHY - THE SCIENCE OF PHYSICAL GEOGRAPHY. A STUDY OF THE FEATURES AND NATURE OF THE EARTH SURFACE.

PLANKTON - A TERM FOR AN ASSEMBLAGE OF MICRO-ORGANISMS, BOTH PLANT AND ANIMAL. WHICH FLOAT, DRIFT OR SWIM IN THE WATER AND IN THEIR MOVEMENTS ARE SUBJECT TO WAVE AND CURRENT ACTION.

POLLUTION - THE PRESENCE OF ANY FOREIGN SUBSTANCE IN WATER WHICH TENDS TO DEGRADE ITS QUALITY SO AS TO CONSTITUTE A HAZARD OR IMPAIR THE USEFULNESS OF THE WATER.

POND - A SMALL BODY OF WATER SURROUNDED BY LAND. THE ILLINOIS DEPARTMENT OF CONSERVATION CLASSIFIES ALL IMPOUNDMENTS LESS THAN SIX SURFACE ACRES AS PONDS.

POOLS - DEEPER PORTIONS OF A STREAM, USUALLY WITH A SMOOTH SURFACE AND SLOW FLOW.

PPM - ABBREVIATION FOR PARTS PER MILLION IN TERMS OF UNIT OF WEIGHT. USED TO REPORT THE AVAILABILITY OR PRESENCE OF SALTS, NUTRIENTS, GASES AND TOXIC MATERIALS IN WATER.

PRIMARY PRODUCTIVITY - THE RATE AT WHICH ENERGY IS STORED BY PHOTOSYNTHETIC AND CHEMO-SYNTHETIC ACTIVITY OF PRODUCER ORGANISMS (GREEN PLANTS) IN THE FORM OF ORGANIC SUBSTANCES WHICH CAN BE USED AS FOOD MATERIALS.

REHABILITATION - TO RESTORE TO A GOOD CONDITION. IN THE CASE OF UNDESIRABLE FISH POPULATIONS, THE POPULATION IS REMOVED IN WHOLE OR PART IN ORDER TO RESTORE IT TO A GOOD CONDITION.

RELIEF - A CONTOUR VARIATION OF THE LAND SURFACE IN RELATION TO THE SURROUNDING LAND.

RIFFLES - SHALLOW BUT RAPID CURRENT OVER GRAVEL OR RUBBLE.

ROTENONE - A PLANT ALKALOID AND IS THE ACTIVE INGREDIENT IN DERRIS POWDER, CUBE, BARBASCO, AKAR TUBA AND ALSO IN THE CURRENTLY AVAILABLE FISH TOXICANTS FOR USE IN KILLING FISH.

RUNS - MODERATE TO RAPID CURRENT FLOWING IN A DEEPER NARROWER CHANNEL THAN A RIFFLE BUT THE CURRENT IS NOT AS TURBULENT AS IN A RAPID.

SECCHI DISC - A CIRCULAR PLATE 20 CENTIMETERS IN DIAMETER, THE UPPER SURFACE OF WHICH IS DIVIDED INTO FOUR EQUAL QUADRANTS AND SO POINTED THAT TWO QUADRANTS DIRECTLY OPPOSITE EACH OTHER ARE BLACK AND THE INTERVENING ONES WHITE. THE INSTRUMENT IS USED TO MEASURE LIGHT PENETRATION IN WATER.

SILTATION - THE FILLING OF WATER AREAS BY SEDIMENTS CARRIED IN BY INFLOWING SURFACE WATER.

SPORT FISH - ANY FISH THAT IS SOUGHT AFTER BY ANGLERS USING A POLE AND LINE.

STRATIGRAPHY - A BRANCH OF GEOLOGY DEALING WITH THE CLASSIFICATIONS, NOMENCLATURE, CORRELATION AND INTERPRETATION OF STRATIFIED ROCKS.

STRIP MINE LAKE OR POND - WATER IMPOUNDMENTS RESULTING FROM COAL MINING OPERATIONS NEAR THE SURFACE OF THE GROUND.

SUBSTRATE - THE BOTTOM DEPOSITS OF A LAKE OR STREAM ON WHICH ORGANISMS MAY GROW.

SYNCLINE - SLOPING DOWNWARD IN OPPOSITE DIRECTIONS SO AS TO MEET IN A COMMON POINT OR LINE. A DOWNWARD FOLD OF ROCK STRATA.

TAILWATER - THE PORTION OF A STREAM IMMEDIATELY BELOW A DAM.

TERMINAL MORAINE - A RIDGE OF GLACIAL TILL MARKING THE FARTHEST ADVANCE OF A PARTICULAR GLACIER.

THERMAL STRATIFICATION - DIFFERENCES IN WATER TEMPERATURE FROM THE SURFACE TO THE BOTTOM IN WHICH DISTINCT LAYERS CAUSED BY TEMPERATURE GRADIENTS AND RESULTING CHANGES IN WATER DENSITY.

THERMOCLINE - THE STRATUM OF WATER IN WHICH THERE IS A RAPID RATE OF DECREASE IN TEMPERATURE WITH DEPTH; A MINIMUM OF ONE DEGREE CENTIGRADE PER METER OF DEPTH. THE THERMOCLINE IS LOCATED IMMEDIATELY BELOW THE EPILIMNION.

TOPOGRAPHY - THE DETAILED MAPPING OR CHARTING OF THE FEATURES OF A RELATIVELY SMALL AREA, DISTRICT OR LOCALITY. THE RELIEF FEATURES OR SURFACE CONFIGURATION OF AN AREA.

TURBIDITY - THE DEGREE OF OPAQUENESS OF WATER DUE TO THE AMOUNT OF FINE MATTER IN SUSPENSION.

WATERSHED - THE WHOLE SURFACE DRAINAGE AREA THAT CONTRIBUTES WATER TO A STREAM OR IMPOUNDMENT.

WETLANDS - LAND FEATURES THAT ARE PERMANENTLY WET OR INTERMITTENTLY WATER COVERED SUCH AS SWAMPS, MARSHES, BOGS, MUSKEGS, POTHOLES, SWALES, GLADES, SLASHES, AND OVERFLOW LAND OF RIVER VALLEYS.

WINTERKILL - PARTIAL OR COMPLETE LOSS OF FISH AND ANIMAL LIFE OF A WATER AREA DUE TO THE FORMATION OF A COMPLETE ICE COVER CAUSING OXYGEN DEPLETION FROM WATER STAGNATION.

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